Fishery Data Series No. 11-05

Ninilchik River Chinook Salmon Stock Assessment and Supplementation, 2006

by

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and

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April 2011

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

Figure **Page**

LIST OF APPENDICES

ABSTRACT

In 2006, the total number of Chinook salmon *Oncorhynchus tshawytscha* counted at Ninilchik River weir was 1,412 of which 1,139 were wild and 273 were hatchery-reared. The wild Chinook salmon escapement corresponding to the Sustainable Escapement Goal (SEG) index monitoring period (July 8 through July 24) was 764. The median run timing date during the SEG monitoring period for the wild component was 3 days earlier than the hatchery-reared component at the weir site. Ocean-age-3 was the dominant age class for wild Chinook salmon and ocean-age-1 and -2 were the dominant age classes for the hatchery-reared component. The estimated minimum total inriver sport harvest of hatchery-reared Chinook salmon was 489. Approximately 568,715 Chinook salmon eggs were collected from 102 females during egg takes. Egg survival to the eyed stage was 90%. Fifty-six coded wire tags were decoded from 61 Chinook salmon that were sacrificed at the weir. One stray fish from Crooked Creek was detected and the rest originated from Ninilchik River. The Ninilchik River Chinook salmon supplementation program has provided important sport fishing opportunities for the Ninilchik River and terminal saltwater fisheries. Continuation of the Chinook salmon assessment at Ninilchik River weir is recommended to ensure that adequate escapement of wild Chinook salmon is maintained.

Key words: Chinook salmon, *Oncorhynchus tshawytscha*, Ninilchik River, wild, hatchery, supplementation, enhancement, run, escapement, weir, adipose finclip, coded wire tag.

INTRODUCTION

Ninilchik River is located on the Kenai Peninsula in the Lower Cook Inlet management area (LCIMA) (Figure 1). It is a small, (260 river kilometers [RKM]) non-glacial, anadromous stream with extensive wetlands (122 km^2), and no large tributary lakes (Table 1). There are only three road accessible streams in the LCIMA that support Chinook salmon *Oncorhynchus tshawytscha* sport fisheries: Ninilchik River, Anchor River, and Deep Creek. Angler effort is focused on Ninilchik River earlier in the season because water conditions are generally less turbid. Sport anglers are capable of harvesting a significant portion of the Ninilchik River Chinook salmon run because of its small stream size. Since 1999, the average annual harvest estimate of Ninilchik River Chinook salmon has been about 1,400 fish (Table 2).

In the mid 1980s, the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish (SF) recognized that Ninilchik River Chinook salmon stock was vulnerable to overharvest from the growing Kenai Peninsula sport fishery. In 1987, SF initiated a supplementation program for the Ninilchik River as a way to create sustainable fishing opportunities through stocking hatchery-reared Chinook salmon smolt (Table 3). As a result of the supplementation program, two groups of Chinook salmon (wild and hatchery-reared) now return to the Ninilchik River, which has added an additional level of complexity to the management of escapement and harvest of Ninilchik River Chinook salmon.

The following sections summarize the supplementation program and escapement monitoring, the tools used to evaluate the sport harvest of hatchery-reared fish, and management strategies (for a more thorough review see Kerkvliet and Booz 2010).

SUPPLEMENTATION

The annual supplementation of Chinook salmon for Ninilchik River has remained essentially unchanged since 1995 when stocking levels were reduced to 50,000 smolt (from approximately 200,000 smolt) with 100% of the smolt adipose-clipped and coded-wire-tagged (CWT, Appendix A1).

Since 1988, broodstock collection and egg takes were conducted at a broodstock weir located at Brody Road bridge (7.7 RKM) during the month of July and early August (Figure 2). Only the

progeny from wild Chinook salmon broodstock are used for Ninilchik River stockings. From 1988 through 2002, Chinook salmon smolt were stocked as age-0 fish. Since 2003, due to limited hatchery rearing facilities, all stocked Chinook salmon have been overwintered in the hatchery as parr and released in the spring as age-1 smolt. Starting in 1994, additional broodstock from the Ninilchik River was collected to support stocking at the terminal saltwater fisheries in Kachemak Bay at Nick Dudiak Fishing Lagoon on Homer Spit (NDFL, Table 4), Halibut Cove Lagoon (Table 5) and Seldovia Bay (Table 6). A combination of both wild and hatchery-reared Chinook salmon are used as broodstock for the terminal saltwater fisheries.

ESCAPEMENT MONITORING

ADF&G has monitored Chinook salmon escapement in Ninilchik River since 1962 (Appendix A2). Starting in 1999, all hatchery-reared Chinook salmon returning to Ninilchik River were adipose-clipped and coded-wire-tagged. Since then, all weir counts of wild and hatchery-reared Chinook salmon have been differentiated by examining all Chinook salmon at the weir for the presence or absence of an adipose fin. Currently, escapement is monitored at the broodstock weir during an index monitoring period (July 8–24, Table 7). The Chinook salmon escapement is calculated by removing the holding and egg-take mortalities from the Chinook salmon weir count. On average (1999–2005), 41% of the total wild Chinook salmon weir counts are counted during the index monitoring period (see Table 8 for total weir counts; see Figure 3 for index counts). However, the weir escapement during the index monitoring period does not account for spawning below the weir which may consist of approximately 35% of the total spawning escapement based on aerial survey data (Marsh *Unpublished*[1]).

ESCAPEMENT GOAL

The sustainable escapement goal (SEG) range for wild Ninilchik River Chinook salmon is 400 to 850 fish during the index monitoring period (July 8-24, Appendix A3). This SEG was calculated using the percentile method (Bue and Hasbrouck *Unpublished*[2]) and is based on the wild Chinook salmon weir counts at the Ninilchik River weir during the index monitoring period from 1994 through 2000 (Kerkvliet and Booz 2010).

SPORT HARVEST

Monitoring the Chinook salmon sport harvest at Ninilchik River has become more complicated since the inception of the supplementation program. Since 1977, ADF&G has conducted an annual mail survey called the Alaska Statewide Harvest Survey (SWHS; Howe et al. 1995, 1996, 2001a-d; Jennings et al. 2004, 2006a-b, 2007, 2009a-b; Mills 1979, 1980, 1981a-b, 1982-1994; Walker et al. 2003) to estimate, by area and by fishery, the participation, harvest (fish kept) and catch (fish harvested plus fish released) of sport-caught species (Table 2, Figure 4). Unfortunately, the SWHS only reports total estimates and does not provide the stock composition (wild/hatchery-reared) of the harvest. From 1991 through 2006, periodic assessment of the hatchery-reared contribution to the sport harvest, has been conducted with creel and sport harvest surveys. During high stocking years (1990–1998), these surveys found over 50% of the harvest was hatchery-reared fish (Balland and Begich 2007; Balland et al. 1994;

[1] Marsh, L. E. 1997. Memorandum to B. Clark, ADF&G, on preliminary evaluation of the stocking program at the Ninilchik River. Subsequently referred to as the (Marsh, memorandum).

[2] Bue B. G., and J. J. Hasbrouck, October 2001 report to the BOF, on escapement goal review of salmon stocks of Upper Cook Inlet. Subsequently referred to as (Bue and Hasbrouck, BOF report).

Begich 2006, 2007; Boyle and Alexandersdottir 1992; Boyle et al. 1993; Marsh 1995; Marsh, memorandum).

MANAGEMENT

The sport fishery regulations for Ninilchik River Chinook salmon are designed to conservatively manage for the sustainability of the wild stock. The regulations control harvest by limiting the area open to fishing to the lower 3.2 RKM of the river (to protect the Chinook salmon spawning area), and by limiting fishing openings to three consecutive 3-day weekends (Saturday through Monday) beginning on Memorial Day weekend.

Management of Chinook salmon in the Ninilchik River has been refined since the inception of the supplementation program with a more directed focus towards maximizing the harvest of hatchery-reared fish (Appendix A4). From 1991 through 2001, SF has periodically issued Emergency Orders (EO) to increase the number of fishing days for both wild and hatchery-reared Chinook salmon. Starting in 2002, EOs increased fishing days for hatchery-reared fish only.

In 2004, the Alaska Board of Fisheries (BOF) adopted a regulation that increased the daily bag limit for Ninilchik River Chinook salmon from 1 to 2 of which no more than 1 fish could be a wild Chinook salmon. The intent of this new regulation was to increase the harvest of hatchery-reared Chinook salmon.

This report is part of a continuing series designed to provide information to evaluate the Ninilchik River Chinook salmon supplementation program, and ensure that the wild Chinook salmon escapement at Ninilchik River is managed according to the *Policy for the Management of Sustainable Salmon Fisheries* (5AAC 39.222) and the *Policy for Statewide Salmon Escapement Goals* (5AAC 39.223).

OBJECTIVES

The objectives of this study were as follows:

1. Census the wild and hatchery-reared Chinook salmon escapement into the Ninilchik River from June 30 through August 1, 2006.
2. Census the sex composition and estimate the age composition of each of the wild and hatchery-reared Chinook salmon components of the run into the Ninilchik River from June 30 through August 1, 2006.
3. Estimate the percentage of hatchery-reared Chinook salmon in the inriver sport harvest for 2006.

TASKS

1. Collect, hold, and artificially spawn 93 male and 93 female Ninilchik River Chinook salmon (minimum of 60 wild males and 60 wild females to ensure genetic variation) during July to provide fertilized eggs for releases of hatchery-reared smolt into Ninilchik River, Nick Dudiak Fishing Lagoon on Homer Spit (NDFL), Halibut Cove Lagoon, and Seldovia Bay.
2. Release the following hatchery-reared Ninilchik River Chinook salmon smolt in May and June 2006: approximately 50,000 smolt at Ninilchik River; 210,000 smolt at NFDL; 105,000 smolt at Halibut Cove Lagoon; and 105,000 smolt at Seldovia Bay in June 2006.

3. Assess accuracy of scale age estimates using samples collected from Chinook salmon of a known age determined through coded wire tag (CWT) analysis.
4. Estimate the harvest of hatchery-reared Chinook salmon from Ninilchik River over all three 3-day weekend openings in 2006.
5. Estimate the percentage of hatchery-reared Chinook salmon in the catch for each 3-day fishing period.
6. Estimate length at age for the Ninilchik River Chinook salmon escapement.
7. Gather daily stream temperature, discharge, and tide height data from other agencies.
8. Collect tissue samples for genetic analyses from 200 wild Chinook salmon.

METHODS AND ANALYSIS

ESCAPEMENT MONITORING

Weir Counts

A fixed picket weir (Figure 5) was installed approximately 7.7 RKM (Figure 2) from the mouth of the river on June 30 and operated through August 1. The weir was visually inspected on a daily basis for holes to ensure no fish could pass undetected. The gate to the live box was opened daily at approximately 0800 hours and closed around 2300 hours. Technicians periodically checked the live box and processed all fish as quickly as possible to avoid impeding the migration.

All captured fish were identified to species and tallied for the daily weir counts. All Chinook salmon that entered the live box were examined for an adipose finclip to identify origin (wild or hatchery-reared). The upper edge of the caudal fin was clipped on all Chinook salmon examined at the weir to prevent double sampling of fish in the event of weir failure. The wild and hatchery-reared Chinook salmon escapements were calculated (e.g., by removing the holding and egg-take mortalities from the associated Chinook salmon weir count) for the SEG index monitoring period and the total weir operating period. The total Chinook salmon escapement was calculated as the sum of the wild and hatchery-reared Chinook salmon escapement.

Sustainable Escapement Goal (SEG)

Only the wild Chinook salmon escapement count was used to determine if the SEG was met. The contribution of wild Chinook salmon to the escapement during the SEG index monitoring period (June 8–24) was expressed as the percentage of the total Chinook salmon escapement during the SEG index monitoring period. The percentage of the 2006 Chinook salmon escapement that was hatchery-reared was compared to the average percentage that was hatchery-reared from 1999 through 2005.

Run Timing

The run timing of wild and hatchery-reared Chinook salmon was plotted as a cumulative percentage of weir counts for the SEG index monitoring period. The 2006 cumulative percentages of wild and hatchery-reared Chinook salmon were compared to each other and to their respective 1999 to 2005 cumulative averages.

The daily weir counts of Chinook salmon (wild and hatchery-reared) were plotted against daily water temperatures, discharge and tide heights to identify any general patterns. Observed patterns were investigated further and compared to patterns observed in previous years.

Biological Samples

Technicians systematically sampled every 7th wild and every 4th hatchery-reared Chinook salmon for age and length data. Three scales were taken from the preferred area of the fish (Welander 1940) and lengths were measured from the mid eye to tail fork (METF) length to the nearest 5 mm.

Scale samples were mounted directly to gum cards and later pressed into acetate using a Carver press at 99ºC and 22,500 pounds per square inch (psi) for approximately 2.5 minutes. Scales were read using a microfiche reader and aged with methods described by Welander (1940) and Mosher (1969). Scale age estimates were produced independently of size, sex, and other age estimates. Scale samples were aged twice to estimate within-reader precision. All scale samples that had conflicting ages for the two estimates were re-aged to produce a resolved age which was used for composition and abundance estimates. Original and resolved age estimates were validated using samples of a known age from coded wire tag (CWT) recoveries and expressed as a percent agreement with the known ages. The scale reader had previous experience aging both juvenile and adult salmonid scales and other calcified structures but no experience with Ninilchik River Chinook salmon.

Sex was determined for all Chinook salmon by observing sexual characteristics such as a protruding ovipositor on females and a developing kype on males. The sex ratio of the wild and hatchery-reared components of the Ninilchik River Chinook salmon escapement were both determined.

The proportion of Chinook salmon of age, sex or length class j in group i (wild vs. hatchery-reared salmon in the escapement upstream of the weir) was estimated as a binomial proportion (Cochran 1977) by:

$$\hat{p}_{ij} = \frac{n_{ij}}{n_i} \tag{1}$$

with variance estimated as

$$\text{var}(\hat{p}_{ij}) = \left[\frac{N_i - n_i}{N_i} \right] \frac{\hat{p}_{ij}(1 - \hat{p}_{ij})}{n_i - 1} \tag{2}$$

where:

n_{ij} = the number of fish of age, sex or length class j in the sample from group i,

n_i = the number of group i fish sampled, and

N_i = the number of group i fish in the weir count.

The number of Chinook salmon by age in the escapement of each group was estimated by:

$$\hat{N}_{ij} = N_i \hat{p}_{ij} \tag{3}$$

and its variance was estimated by:

$$\text{var}(\hat{N}_{ij}) = N_i^2 \, \text{var}(\hat{p}_{ij}) \, . \tag{4}$$

The within-reader variability of scale age estimates was calculated using a coefficient of variation (CV) given as the ratio of the standard deviation over the mean age expressed as a percentage (Campana 2001):

$$CV_j = 100\% \times \frac{\sqrt{\sum_{i=1}^{R} \frac{(X_{ij} - X_j)^2}{R-1}}}{X_j} \tag{5}$$

where: X_{ij} = the ith age estimate of the jth fish,

X_j = the mean age estimate of the jth fish,

R = the number of times each fish is aged.

For each sex, age, wild, and hatchery group, the CV_j were averaged across all fish (j) in the group to produce a mean CV.

Genetic Samples

Axillary process[3] samples were collected from all systematically sampled wild Chinook salmon using the methods in *Sampling Non-lethal Finfish Tissues for DNA Analyses* (http://www.cf.adfg.state.ak.us/geninfo/research/genetics/pdffiles/bulk.pdf, accessed January 2006). All samples will be processed and analyzed by the Alaska Department of Fish and Game Gene Conservation Laboratory and included in the coastwide Chinook salmon genetics baseline database.

EGG TAKES

During escapement monitoring, an inriver holding area was established using a weir upstream of the escapement weir (Figure 5). Plywood panels (2' x 3') were placed on the lower weir during periods of low water to increase the water depth in the holding area to provide a rest area for fish. As Chinook salmon were processed through the live box, those fish showing signs of attaining more immediate sexual maturity were transferred into the holding area rather than allowing them to escape upstream of the weir. We began transferring fish into the holding area on July 2.

Egg takes were conducted on July 26, July 31, and August 1. All Chinook salmon were spawned in a matrix, 4 at a time with a sex ratio of 2:2 to ensure egg fertilization (Hoffnagle et al. 2003). Held fish were captured with a seine and dip nets. Males and unripe females were sorted into net pens. Ripe females were killed, placed on their back on an angled rack with their heads tilting downward. Females were bled (bled-out) by ripping a gill arch to prevent blood from mixing with the eggs. To collect and fertilize the eggs, each bled-out female was held above a dry plastic bucket then her abdomen was cut open from the vent to the gill plate. Loose eggs were then collected in the bucket. Mature males were randomly selected from the net pens. Immature males were released upstream of the weir and mature males were live spawned before they were

[3] The *axillary process* is a spine located above the pelvic fin.

released upstream of the weir. To prevent water from the males dripping on the unfertilized eggs causing them to water harden, each male was live spawned into a dry cup. The milt was then poured into the bucket of eggs. Upon mixing the eggs and milt, a 7 g per liter saline solution was added to increase sperm motility. Fertilized eggs were then rinsed and placed into a plastic bag to water harden before being transported to the Fort Richardson hatchery.

Only wild Chinook salmon were used to supplement the Ninilchik River. A combination of wild and hatchery-reared Chinook salmon was used to stock the saltwater terminal release sites. The head, length and a scale sample were collected from sacrificed hatchery-reared females for age validation and to detect straying.

WATER TEMPERATURE, DISCHARGE AND TIDES

Cook Inletkeeper (CIK), a citizen-based nonprofit group, collected water temperature in degrees Celsius once every 15 min using a temperature logger at their NR-2 site (described in Mauger 2005). The NR-2 site (RKM 13.7) is located ~6.0 RKM upstream (Figure 2) from the Ninilchik River weir site.

The discharge data presented in this report was collected by the National Weather Service, Alaska Pacific River Forecast Center (RFC) at the Beach Access Road bridge (RKM 0.9; Figure 2). RFC contracted a local citizen to collect a daily stage reading (in feet) at approximately the same time each day (~ 1900 hours) using a wire weight gauge. Collected stage readings were then converted to discharge in cubic feet per second (ft^3/s) using a rating curve of previous discharge and stage measurements from the same Ninilchik River site. The RFC data are not formally published, and should be considered provisional.

The predicted daily high and low tide heights for Ninilchik River were located on the National Oceanic and Atmospheric Administration (NOAA) tides and current website at http://tidesandcurrents.noaa.gov. Predicted high tides heights were corrected from the Seldovia reference station by adding 1.2 ft. No correction factor was used for low tide heights.

STOCKING

Smolt Release and Marking

The Chinook salmon eggs used for stocking were reared to smolt at the Fort Richardson hatchery. All hatchery-reared Chinook salmon smolt released at Ninilchik River were thermal marked, adipose-clipped, and injected with a CWT by hatchery personnel. All smolt released at Halibut Cove Lagoon, Seldovia Bay, and the NDFL were only thermal marked. Hatchery personnel also assessed the average length and weight for all smolt released, and the percentage of acceptable adipose finclips and CWT losses was assessed before they were released at Ninilchik River. The Statewide Stocking Plan (Loopstra 2003) was used to plan and schedule the release of LCIMA smolt.

Straying

Every 8^{th} Chinook salmon with no adipose fin was sampled and sacrificed for CWT-analysis. Collected heads were labeled with a numbered cinch strap, frozen, and sent to the ADF&G

Mark, Tag and Age Laboratory in Juneau for analysis. Results were accessed from the ADF&G Tag Lab website[4], using parameters specific to the Ninilchik River Chinook salmon project.

INRIVER FISHERY

By regulation, the Ninilchik River Chinook salmon inriver sport fishery was open on the weekends of May 27 to 29, June 3 to 5, and June 10 to 12, 2006. The inriver sport fishery was also extended by emergency order (EO) 2-KS-7-12-06 from June 14 through July 14, 2006 for the harvest of hatchery-reared Chinook salmon only (Appendix A4). The inriver sport fishery occurred from the mouth of the river to an ADF&G regulatory marker located approximately 2 miles (3.2 RKM) upstream.

Angler surveys were conducted during each 3-day weekend opening of the regulatory inriver sport fishery to estimate the hatchery-reared percentage of Chinook salmon harvest and catch (fish harvested plus fish released) in each 3-day weekend opening and to estimate the minimum total harvest of hatchery-reared Chinook salmon. Survey times were directed towards periods of greatest harvest for each 3-day weekend opening (Begich 2006). A SF roving surveyor examined harvested Chinook salmon and questioned anglers on the origin (wild/hatchery-reared) of any released Chinook salmon. A SF stationary surveyor also collected harvest data that were used to weight the estimated hatchery-reared percentages of Chinook salmon harvest during each 3-day weekend opening.

Four 4-h roving surveys[5] were conducted during each 3-day weekend opening. The first survey was conducted at the start of each 3-day weekend opening from midnight to 0400 hours. The rest of the roving surveys were conducted from 0400 to 0800 hours daily. Two 4-h stationary surveys were conducted from 0400 to 0800 hours on the first and third day of each 3-day weekend opening. Fewer stationary surveys were conducted because of a personnel shortage.

To supplement the roving survey, a local sport fishing guide recorded the harvest and catch of wild and hatchery-reared Chinook salmon of his clients during the regulatory and EO fisheries.

Survey Area

The Ninilchik River roving survey area included the entire area open to sport fishing. However, the survey area was divided into two river reaches. Reach 1 included the river section between Ninilchik River mouth and the Beach Access Road bridge (RKM 1.25). Reach 2 included the river section between the Beach Access Road bridge and the upstream ADF&G regulatory marker (RKM 3.2) (Figure 2). Reach 1 is tidally influenced under normal conditions and Reach 2 is usually above tidal influence.

The stationary survey was conducted in the area under the Sterling Highway bridge (approximately 1.9 RKM). This area was selected to avoid any tidal influence on the harvest and catch.

[4] Mark, Tag and Age Laboratory Database [Internet]. Juneau, AK: ADF&G. 2006. [9/27/2006 9:07 AM]. Available from http://tagolabweb.adfg.state.ak.us/CWT/reports/.

[5] The *roving survey* technique is an on-site intercept method by which the creel clerk contacts anglers as he or she moves through the fishing area along a predetermined route. Creel clerks usually travel by boat, but it is possible to rove among access points by means of a vehicle or contact shore anglers on foot (Murphy and Willis 1996).

Percent of Hatchery-Reared Fish in Harvest

SF personnel roved throughout both stream reaches and examined harvested fish for an adipose fin and tallied the number of Chinook salmon with and without an adipose finclip in each sample reach for each hour of the survey. No attempt was made to collect age, sex and length data from harvested fish or collect heads from hatchery-reared fish. Harvest of ocean-age-1 Chinook salmon (jacks: based on total length (TL) < 500 mm) were tallied separately. We assumed that there was no relationship between harvest of hatchery-reared fish (versus wild fish) and time of day. Chi-square tests were used to identify differences in the proportions of hatchery-reared Chinook salmon between the three regulatory 3-day weekend openings and between reaches. The percentage of the harvest that was hatchery-reared for fishery opening *i* was estimated as the proportion:

$$\hat{h}_i = \frac{x_i}{n_i} \tag{6}$$

with variance estimated as:

$$\text{var}(\hat{h}_i) = \frac{\hat{h}_i(1-\hat{h}_i)}{n_i - 1} \tag{7}$$

where:

x_i = the number of fish of hatchery-reared origin sampled in regulatory opening *i*,

n_i = the number of fish sampled in regulatory opening *i*.

Weighted Total Harvest of Hatchery-Reared Fish

The SF stationary surveyor tallied the total number of Chinook salmon harvested from an area under the Sterling Highway bridge for each hour of the survey. Although the stationary survey occurred simultaneously with the roving survey, separate personnel worked independently for each survey. Occasionally, the stationary surveyor also examined the harvested Chinook salmon for the presence of an adipose fin when fishing was slow. The tallied number of Chinook salmon with and without an adipose finclip was included with the roving survey data set.

Total fishing effort and harvest of Chinook salmon from the Ninilchik River in 2006 was estimated by the SWHS. The weighted proportion of hatchery-reared Chinook salmon in the harvest was estimated by weighting the 3-day weekend opening-specific hatchery-reared proportions in the harvest by weights obtained from the stationary observer. The total harvest of hatchery-reared fish was then estimated by multiplying the weighted proportion of hatchery-reared fish by the SWHS estimate of total harvest:

$$\hat{H} = \hat{N}_{SWHS} \sum_{i=1}^{3} w_i \hat{h}_i \tag{8}$$

with variance estimated as:

$$\text{var}(\hat{H}) = \hat{N}_{SWHS}^2 \sum_{i=1}^{3} w_i^2 \text{ var}(\hat{h}_i) + \left[\sum_{i=1}^{3} w_i \hat{h}_i \right]^2 \text{var}(\hat{N}_{SWHS}) - \text{var}(\hat{N}_{SWHS}) \sum_{i=1}^{3} w_i^2 \text{ var}(\hat{h}_i) \quad (9)$$

where:

$\hat{N}_{SWHS}$ = SWHS estimate of total harvest for the Ninilchik River in 2006 and

$$w_i = \frac{h_{Si}}{\sum_{i=1}^{3} h_{Si}} \quad (10)$$

where:

h_{Si} = the proportion of the overall harvest observed by the stationary surveyor in each fishery opening *i*.

The total harvest of hatchery-reared jack Chinook salmon was estimated in a similar fashion to the total hatchery-reared harvest estimate. The jack proportion of the total hatchery-reared harvest for each 3-day weekend opening was weighted with the same weights derived from the stationary survey. The weighted proportion was then multiplied to the SWHS harvest estimate to produce the total hatchery-reared jack harvest.

Since an unknown number of hatchery-reared Chinook salmon were harvested during the EO fishery after the survey was conducted, the estimates for hatchery-reared jack and total harvest should be viewed as a minimum.

Percent of Hatchery-Reared Fish in Catch

The percentage of the Chinook salmon catch that was hatchery-reared in each 3-day weekend opening was estimated from interviewing anglers during roving surveys on the number of Chinook salmon they had released combined with the harvest data. No attempt was made to estimate catch rates or trip durations. The hatchery-reared percentage of catch estimate and its variance were calculated using the same formula as the percentage of harvest estimate. Chi-square tests were used to identify differences in the proportions of hatchery-reared fish in the Chinook salmon catch over the three regulatory 3-day weekend openings by regulation and between reaches.

Local Guide Harvest

During the inriver sport fishery, a volunteer sport fishery guide noted the catch and harvest of wild and hatchery-reared Chinook salmon in the freshwater sport fish guide logbook[6] for each guided trip. The hatchery-reared percentage of Chinook salmon caught and harvested was estimated for each regulatory 3-day weekend opening and for each week of the EO fishery. The percentage of hatchery-reared and wild Chinook salmon in the catch and harvest for each guided trip was estimated as a binomial proportion (Cochran 1977) by:

[6] 2006 Freshwater Sport Fish Guide Logbook and Vessel Registration. ADF&G, Division of Sport Fish, Anchorage. *Note:* A logbook is required by all sport fish charter and guide services operating in Alaska. It is the responsibility of the business owner to obtain the logbook and assure that all data for fishing activities is submitted to ADF&G.

$$\hat{p}_j = \frac{n_j}{n} \tag{11}$$

where the subscript *j* represents wild or hatchery-reared. The variance was estimated as:

$$\text{var}(\hat{p}_j) = \frac{\hat{p}_j(1-\hat{p}_j)}{n-1}. \tag{12}$$

No finite correction factor was used because the inriver population size during each guided trip was unknown. Chi-square tests were used to identify differences in the proportions of hatchery-reared fish in the Chinook salmon harvest between the three regulatory 3-day weekend openings and the EO fishery. Data from the roving survey and logbook data were also compared.

RESULTS

ESCAPEMENT MONITORING

Weir Counts

In 2006, the total number of Chinook salmon counted past Ninilchik River weir from June 30 through August 1 was 1,412 of which 1,139 were wild and 273 were hatchery-reared (Table 8, Appendix B1). After subtraction of egg-take mortalities (102 spawned and 34 holding mortalities) and coded wire tag (CWT) recoveries (34 fish), the total escapement was 1,242 Chinook salmon, of which 84% were wild and 16% were hatchery-reared.

Sustainable Escapement Goal (SEG)

During the SEG index monitoring period (June 8–24), 764 wild and 123 hatchery-reared Chinook salmon were counted at the weir. The contribution of wild Chinook salmon to the total escapement for the SEG index monitoring period was 86.1% (Table 7 [764/887], Figure 3). The wild Chinook salmon SEG weir count was above the 1999-2005 average by 103 fish. The percentage of hatchery-reared Chinook salmon in the run for 2006 (16% [204/1,242]) was similar to 2005 (16% [409/2,485]) but lower than the 7-year average from 1999 through 2005 (25% [487/1,959], Table 8).

Run Timing

Median run timing date during the SEG index monitoring period for the wild component (July 15) was 2 days earlier than that of the hatchery-reared component (July 17, Figure 6, Appendix B1).

WATER TEMPERATURE, DISCHARGE, AND TIDES

Average daily water temperatures and average daily discharges remained stable during June 29 through August 1 weir operations and no general trend with daily weir counts emerged (Figure 7, Appendices C1–C2). The average water temperature during the SEG index monitoring period was 12°C and ranged from 9 to 16°C (Table 9). The average discharge during the SEG counting period was 84 ft^3/s (range = 73 to 113 ft^3/s; Table 9, Appendix C2). Daily weir counts were generally higher on days when the average high tide height was greater. The daily high tide height ranged from 12.9 to 21.6 ft and averaged 17.7 ft while the daily low tide height ranged from -4.1 to 7.0 ft and averaged 2.3 ft (Appendices C3–C4).

BIOLOGICAL SAMPLES

Age, Sex, and Length

In 2006, 159 wild and 68 hatchery-reared Chinook salmon were sampled for age at Ninilchik River weir. However, 12% (19/159) of the wild and 1% (1/68) of hatchery-reared scale samples were not readable due to regeneration or poor mounting (Table 10); therefore, only 140 wild and 67 hatchery-reared Chinook salmon scale samples were aged. Ocean-age-3 was the dominant age class for wild Chinook salmon (40.0%, SE = 3.9%). Ocean-age-1 and ocean-age-2 were the dominant age classes for hatchery-reared Chinook salmon (32.8%, SE = 5.0%; Figure 8). Ocean-age-3 was the dominant age class for both wild and hatchery-reared females. Ocean-age-2 was the dominant age class for wild male Chinook salmon, while ocean-age-1 was the most common age class in hatchery-reared male Chinook salmon. The age composition for wild and hatchery-reared Chinook salmon was similar for females (P = 0.876) but not for males (P = 0.0003).

The coefficient of variation (CV, Equation 5) of all scale age estimates was 2.5%. The CV for wild and hatchery-reared scale readings was 2.2% and 2.8%, respectively. Both were, similar to the overall precision. Only ocean-age-2 females were associated with a CV (wild: 6.7%, hatchery-reared: 8.9%) different substantially from the overall CV. We did not conduct a statistical test of this difference.

Age was determined for 56 hatchery-reared Chinook salmon with CWTs (a CWT was not detected in 5 of 61 adults recovered; Table 11). Scale regeneration was found in 7.1% (4/56) of the known age samples. There was a 90% agreement for each original scale reading with known ages (46/51 and 47/52, respectively). No pattern was evident in the 10% of misinterpreted scales aged. Only one sample was not correctly aged at any time. The resolved age estimates had a 98% (51/52) agreement with known age samples.

Sex was determined for all but 4 wild and 2 hatchery-reared Chinook salmon counted at the weir. The sex ratio of males to females was similar (P = 0.08) between the wild (607:528) and hatchery-reared (161:110) components (Table 10, Figure 8). The mean length of wild female (789 mm) and male (661 mm) Chinook salmon was larger ($P < 0.05$) than the mean length of hatchery-reared female (730 mm) and male (540 mm) Chinook salmon.

Genetic Samples

Axillary process samples were collected from 159 wild Chinook salmon during Ninilchik River weir operations. Samples were sent to the ADF&G Gene Conservation Laboratory for processing and analysis.

EGG TAKES

Hatchery personnel increased the pre-season spawning goal of 93 female Chinook salmon (60 wild, 33 hatchery-reared) to 97 (60 wild, 37 hatchery-reared). Approximately 568,715 Chinook salmon eggs were collected from 102 females (Table 12). Seventy three of the females spawned were wild and 29 were hatchery-reared. The egg take conducted on July 19 sacrificed 36 wild and 8 hatchery-reared females and had an 86.0% egg survival to the eyed stage. The egg take conducted on July 26 sacrificed 31 wild and 16 hatchery-reared females and had a 94.0% egg survival to the eyed stage. The egg take conducted on August 1 sacrificed 6 wild and 5 hatchery-reared females and had a 95.0% egg survival to the eyed stage. The average percent survival to

the eyed stage (90.2%) was the highest since the establishment of the hatchery supplementation program. The maximum water temperatures recorded during the egg takes were 11°C (July 19), 11°C (July 26) and 12°C (August 1, Appendix C1).

STOCKING

Smolt Release and Marking

Stocking goals[7] were reached for all stocking locations (Tables 3–6). Chinook salmon smolt releases in 2006 were apportioned between the Ninilchik River and three terminal saltwater fisheries as follows: 57,537 smolt were stocked at Ninilchik River; 224,053 smolt were stocked at NDFL; 117,549 smolt were stocked at Halibut Cove Lagoon; and 113,974 smolt were stocked at Seldovia Bay.

Straying

A total of 61 hatchery-reared Chinook salmon were sacrificed for CWT analysis (Table 11, Appendix D1). Thirty four were sacrificed from the systematic weir samples and 27 were collected from females sacrificed at the egg takes. Coded wire tags were successfully decoded from 56 samples. One stray from Crooked Creek was detected. This fish was captured at the weir on July 26 and was not used in the egg take. The rest of the samples originated from Ninilchik River. In 2006, no strays from Ninilchik River were detected in LCI fisheries or escapement projects (Appendices D2–D4).

INRIVER FISHERY

Percent of Hatchery-Reared Fish in Harvest

During the three regulatory 3-day weekend openings, roving surveyors examined 311 harvested Chinook salmon for the presence or absence of an adipose fin (Table 13, Table 14, and Appendix E1). Overall, 39.2% of the harvest (122/311 fish, SE = 2.8%) were hatchery-reared Chinook salmon (jacks included; Table 13). The percentage of hatchery-reared fish harvested for the first weekend opening (May 27–29) was 25.4% (15/59, SE = 5.7%), for the second weekend opening (June 3–5) was 42.2% (46/109, SE = 4.8%) and for the third weekend opening (June 10–12) was 42.7% (61/143, SE = 4.2%). Jack Chinook salmon comprised 17.7% (55/311) of the total examined harvest and most (81.8%, 45/55) were hatchery-reared. Excluding jack Chinook salmon (Table 14), the overall hatchery-reared percentage of Chinook salmon harvested was 30.1% (77/256, SE = 2.9%) and ranged from 24.1% (13/54, SE = 5.9%) to 34.2% (41/120, SE = 4.3%) for all regulatory 3-day weekend openings combined.

No statistically significant differences (χ^2 = 5.83, df = 2, P = 0.054) were detected in the hatchery-reared proportion of Chinook salmon harvest between the three 3-day weekend openings of the regulatory fishery. No statistically significant differences were detected (χ^2 = 2.04, df = 2, P = 0.36) when jacks were excluded from the analyses.

The hatchery-reared proportion of the Chinook salmon harvest was significantly higher (χ^2 = 6.14, df = 1, P = 0.013) for Reach 1 (80/177) than Reach 2 (42/134) (Table 13, Figure 9). The percentage of hatchery-reared harvest excluding jacks was similar for both Reach 1 (28.9% [37/128], SE = 4.0%) and Reach 2 (31.3% [40/128], SE = 4.1%) (Table 14). There were no

[7] Hatchery-reared Ninilchik River Chinook salmon smolt stocking goals: Ninilchik River 50,000 smolt; NDFL 210,000 smolt; Halibut Cove Lagoon 105,000 smolt; and Seldovia Bay 105,000 smolt.

statistically significant differences in the hatchery-reared proportions detected for the harvest between the reaches when jacks were excluded from the analyses ($\chi^2 = 0.17$, df = 1, $P = 0.68$).

The harvest of hatchery-reared Chinook salmon was 53.8% (43/80) jacks in Reach 1, 4.8% (2/42) in Reach 2 and 36.8% (45/122) for Reaches 1 and 2 combined. The percent of the hatchery-reared harvest that were jacks ranged from 13.3% on the first weekend to 50% on the second weekend (Figure 10).

Weighted Total Harvest of Hatchery-Reared Fish

During the three regulatory 3-day weekend openings, the stationary surveyor observed a total of 60 harvested Chinook salmon (Table 15). The estimated weighted percent of the Chinook salmon harvest for the three regulatory 3-day weekend openings ranged from 26.7% (SE = 11.4%) on the second weekend to 40.0% (SE = 10.2%) on the third weekend.

The SWHS estimated total instream harvest in 2006 was 1,329 (Table 2, Figure 4). By applying equation (8), the minimum weighted hatchery-reared harvest estimate was 489 (SE = 107). The weighted estimated hatchery-reared jack Chinook salmon harvest was 151 fish and approximately 11% of the total Chinook salmon harvest.

Percent of Hatchery-Reared Fish in Catch

Angler interviews yielded an additional tally of 70 Chinook salmon that were released. The overall catch (jacks included) was comprised of 35.4% (SE = 2.5%) hatchery-reared Chinook salmon (Table 13). The estimated hatchery-reared percentage of the catch for the first weekend was 22.5% (16/71, SE = 5.0%), for the second weekend was 38.3% (51/133, SE = 4.2%), and for the third weekend was 38.4% (68/177, SE = 3.7%).

Statistically significant differences ($\chi^2 = 6.35$, df = 2, $P = 0.04$) were detected in the proportions of hatchery-reared Chinook salmon in the catch over the three regulatory 3-day weekend openings. No statistically significant differences were detected in the catch ($\chi^2 = 2.47$, df = 2, $P = 0.29$) when jacks were excluded from the analyses.

The overall hatchery-reared percentage of catch was significantly higher ($\chi^2 = 11.39$, df = 1, $P = 0.001$) for Reach 1 (43.1% [88/204]; SE = 3.5%) than Reach 2 (26.6% [47/177]; SE = 3.3% [Table 13, Figure 9]). The hatchery-reared percentage of catch excluding jacks was similar for both Reach 1 (28.8% [44/153]; SE = 3.7%) and Reach 2 (26.5% [45/170]; SE = 3.4% [Table 14]). There were no statistically significant differences detected for the catch ($\chi^2 = 2.47$, df = 1, $P = 0.65$) between the reaches when jacks were excluded from the analyses.

Local Guide Harvest

The percentage of hatchery-reared Chinook salmon in the catch during the regulatory fishery as estimated from the logbook trip data (15.1% [11/73]; SE = 4.2% [Table 16]) was lower than the percentage in the roving survey catch data (jacks excluded) (27.6% [89/323]; SE = 2.5% [Table 14]). The percentage of hatchery-reared fish in the harvest as estimated from the logbook trip data (26.8% [11/41]; SE = 7.0% [Table 16]) was similar to the overall roving survey percentage (30.1% [77/256]; SE = 2.9% [Table 14]). The hatchery-reared percentage of the Chinook salmon catch from the logbook trip data for the three 3-day weekend openings (15.1% [11/73]; SE = 4.2%) was lower than the percent in the catch for the fishery opened by emergency order (25.4% [74/291]; SE = 2.6% [Table 16]). No statistically significant differences were detected for the hatchery-reared proportion of the Chinook salmon catch over the regulatory fishery

($\chi^2 = 1.56$, df = 2, $P = 0.46$), EO fishery ($\chi^2 = 0.96$, df = 3, $P = 0.81$), or between fisheries ($\chi^2 = 5.63$, df = 6, $P = 0.47$).

DISCUSSION

The wild Ninilchik River Chinook salmon run met its sustainable escapement goal (SEG) and escapement was above average for 2006. The run of hatchery-reared Chinook salmon was below average but continued to build after the SEG counting period, with 19.4% (53/273) of the hatchery-reared fish passing through the weir in the last 4 days (July 29 to August 1) of the weir operation. In 2006, despite the emergency order (EO) to reduce the number of hatchery-reared fish in the escapement, the hatchery-reared fish counted during the SEG index monitoring period was only six fish less (123) than in 2005 (129) when an EO was not issued (Kerkvliet and Booz 2010). In the future, educating the public on current regulations may result in the harvest of more hatchery-reared Chinook salmon.

In 2006, the run timing of the wild and hatchery-reared Chinook salmon was compared only during the SEG index counting period because the weir was not operated for the total run. The 1999 through 2005 average median run timing date for wild Chinook salmon was on average 11 days earlier than the hatchery-reared component (Kerkvliet and Booz 2010). The differences in run timing are less pronounced for weir counts from the SEG counting period.

The 2006 age composition for both wild and hatchery-reared Chinook salmon differed from previous years. On average, ocean-age-3 was the dominant age class for wild and hatchery-reared components and for both sexes. In 2006, age composition for wild and hatchery-reared males was dominated by ocean-age-2 and ocean-age-1, respectively. The reasons for the shift in wild males are unknown. We do not expect the difference to be explained by between-reader differences; the scale reader for the 2006 samples read a subset of the 2005 scales and there was no difference in the estimated age composition ($P > 0.05$).

It remains unclear why there was a higher percentage of hatchery-reared jack Chinook salmon in both the 2006 weir counts and in the regulatory sport fishery but it may indicate differences in environmental conditions when the smolt were released. The size of smolt at stocking has been known to influence the age composition of the return (Vøllestad et al. 2004). The percentage of hatchery-reared jack Chinook salmon returning to Crooked Creek declined in years when the average weight of smolt was reduced to approximately 12 to 13 g (Jeff Breakfield, Sport Fish Biologist, ADF&G, Soldotna, personal communication). However, in 2005, 82.4% of smolt released into the Ninilchik River ranged from 5.1 to 15.0 g (mean = 12.5, SD = 2.8), which is similar to stocking weight from 1999 to 2004 (mean = 12.3, SD = 3.4; Loopstra and Hansen 2005; Loopstra et al. 2000, 2002). The proportion of jacks may also be influenced by the additional amount of time that Chinook salmon are reared at the hatchery prior to stocking. Before 2004, Fort Richardson hatchery released Ninilchik River Chinook salmon smolt as freshwater age 0, then in 2004 they began releasing smolt as freshwater age 1. To continue to monitor this shift in age composition, the total number of jacks counted at the weir will be tallied to check if the contribution remains elevated in the escapement.

It is problematic to age scale samples from Chinook salmon collected later in the run because of scale re-absorption which leads to torn edges when the scales are collected. Both of these scale characteristics make it difficult to identify the outer annuli and age the scale properly. Although the within-reader variability for scale age estimates was at an acceptable level, the increased coefficient of variation measured on ocean-age-2 female Chinook salmon suggests that those

samples were more difficult to age due to quality of the scale samples. A comparison between actual age, based on CWT data, and age estimates suggests good accuracy for all age estimates. Establishing a reference set of scale samples of known ages would be a useful tool for educating technicians on scale-aging techniques.

We obtained tissue samples from 149 wild Chinook salmon for genetic analyses, which was less than our goal of 200 by 41 fish. Hopefully, the collected samples will provide a genetic baseline signature for the identification of Ninilchik River wild Chinook salmon. Once baseline signatures are identified for other stocks, collecting genetic samples from harvested fish in a mixed-stock fishery will allow for a cost effective method of assessing the stock composition of the harvest. Currently, the Ninilchik River Chinook salmon are harvested in the Cook Inlet marine sport fishery that occurs from Bluff Point to north of the Ninilchik River.

The increased survival of eggs to the eyed stage may be attributed to a combination of factors. First, in 2006, the Ninilchik River had cooler water temperatures than previous years. Also, slight changes to our methods to reduce the stress of sorting ripe fish and to avoid water hardening of eggs during fertilization may have contributed to the increased survival.

The estimated percentage of hatchery-reared Chinook salmon in the inriver sport harvest was lower than the earlier harvest surveys conducted on the Ninilchik River despite the bag limit regulation change in 2005 (Balland and Begich 2007; Balland et al. 1994; Begich 2006; Boyle and Alexandersdottir 1992; Boyle et al. 1993; Marsh memorandum). The 2006 estimated percentage and total harvest of hatchery-reared Chinook salmon should be viewed as minimum estimates because of the additional and unknown amount of harvest of hatchery-reared Chinook salmon during the EO fishery, which lasted 31 days.

The weighted total hatchery-reared Chinook salmon harvest (489) was similar to an un-weighted hatchery-reared harvest estimate (520). This result is confounding since the weighted estimate should be more accurate, because it compensated for different harvest composition between the three 3-day weekends openings. The size of the area or the number of survey periods for the stationary survey may not have been large enough to represent actual harvest. Regardless, the results suggest that most of the sport harvest is wild Chinook salmon; however, the hatchery-reared proportion does contribute to the total harvest.

To properly assess the hatchery-reared harvest and catch proportions required a large amount of field personnel time. If future surveys are conducted to estimate the total hatchery-reared harvest, eliminating the weighted survey could produce an acceptable, cost beneficial estimate.

The composition of the Chinook salmon catch provided some additional insight on run timing. Statistically significant differences in the hatchery-reared proportion of catch between openings over the regulatory fishery suggest that more hatchery-reared fish are available later in the fishery. Ultimately, a more thorough understanding of inriver run timing for wild and hatchery-reared Chinook salmon and the availability of hatchery-reared Chinook salmon for the sport fishery would allow an increased harvest of hatchery-reared fish. This understanding could be accomplished by beach seining on a weekly basis and would require less field personnel time than conducting roving surveys.

The logbook data seem to provide similar estimates of the percentage of hatchery-reared Chinook salmon in the catch and harvest to the weir data. The guide primarily fished upstream of the Sterling Highway bridge. The increased percentage between the regulatory fishery and the

EO fishery of hatchery-reared Chinook salmon in the catch reported in guide logbook data suggests that the extension of the fishery through emergency order did reduce the escapement of hatchery-reared Chinook salmon.

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TABLES

Table 1.-Characteristics of Ninilchik River drainage.

Drainage characteristics	Total
Watershed area	347.9 km²
Wetland area	122.5 km²
Percent wetlands	35.2 %
Stream length	260.7 RKM
Anadromous stream length	81.0 RKM
Percent mapped anadromous	31.1%

Source: S. Baird, Kachemak Bay Research in Homer, AK, unpublished data, 2006.

Note: "RKM" = river kilometers.

Table 2.-Statewide Harvest Survey estimates of angler effort and Chinook salmon harvest and catch compared to weir counts with exploitation rates of Ninilchik River Chinook salmon, 1977–2006.

Year	Angler Effort-Days Fished[a]	Chinook salmon					
		Harvest (no. of fish)	Catch[b] (no. of fish)	Percent hatchery harvest[c]	Total weir count[d]	Expanded total weir count[e]	Exploitation rate (%)
1977	11,350	1,168	ND	NA	ND	–	–
1978	14,173	1,445	ND	NA	ND	ND	–
1979	18,282	1,493	ND	NA	ND	ND	–
1980	19,706	723	ND	NA	ND	ND	–
1981	14,184	1,523	ND	NA	ND	ND	–
1982	11,806	1,240	ND	NA	ND	ND	–
1983	9,458	871	ND	NA	ND	ND	–
1984	10,122	648	ND	NA	ND	ND	–
1985	10,213	983	ND	NA	ND	ND	–
1986	9,250	420	ND	NA	ND	ND	–
1987	13,329	1,112	ND	NA	ND	ND	–
1988	12,533	795	ND	NA	ND	ND	–
1989	9,997	744	ND	ND	254	452	–
1990	8,323	693	1,598	ND	315	567	–
1991	19,640	3,123	5,260	77	338	950	–
1992	27,816	5,316	11,425	57	539	1,785	–
1993	20,466	4,235	9,491	50	NL	-	–
1994	21,827	3,108	5,482	45	549	1,091	–
1995	16,160	2,451	4,313	50	1,150	1,614	–
1996	11,445	2,401	7,481	50	944	1,746	–
1997	11,064	3,263	6,879	ND	1,096	1,374	–
1998	10,994	1,453	3,395	ND	1,002	1,378	–
1999	15,344	1,945	4,153	ND	2,285	–	46.0
2000	12,432	1,782	4,648	49	2,487	–	41.7
2001	10,602	1,399	3,014	51	2,087	–	40.1
2002	9,572	830	2,180	ND	2,075	–	28.6
2003	9,843	1,452	4,205	ND	1,683	–	46.3
2004	10,500	1,240	2,961	ND	2,061	–	37.6
2005	9,003	1,342	2,042	ND	2,703	–	33.2
2006	9,620	1,329	3,003	$\geq 39^{t}$	1,412	1,862	–
Average Pre-Stocking (1977-1990)	12,338	990	1,598				
High Stocking (1991-1998)	17,427	3,169	6,716	55		1,420	
Low Stocking (1999-2005)	11,042	1,427	3,315	50	2,197		39.1

-continued-

Source: Statewide harvest survey estimates for days fished and Chinook salmon harvest and catch gathered from the published reports for each year. Howe et al. 1995, 1996, 2001a-d; Jennings et al. 2004, 2006a-b, 2007, 2009a-b; Mills 1979, 1980, 1981a-b, 1982-1994; Walker et al. 2003.

Note: "NL" = no data located; "ND" = no data; "-" = cannot be computed due to limitations of the data; NA = not applicable.

[a] The estimate for days fished are for the entire season not just for Chinook salmon.

[b] Catch is defined as the number of fish caught-and-released and harvested. Estimates from: Gretchen Jennings, project manager, Alaska Statewide Harvest Survey unpublished data, ADF&G, Division of Sport Fish, Anchorage.

[c] Estimated by creel survey 1991–1993; estimated by catch sampling from 1994–1996, 2000, 2001, and 2006.

[d] Complete counts in 1999–2005; 1989–1998 and 2006–2007 are partial counts from broodstock weir, no data available for 1993.

[e] Weir counts were expanded by the average number of fish counted from 1999 through 2005 during the weir operation dates for each year that the weir was not operated over the total run.

[f] The 2006 sport harvest survey percent hatchery harvest estimate should be viewed as a minimum since an unknown number of hatchery fish were harvested in a fishery opened by emergency order after the survey was conducted.

Table 3.-Chinook salmon smolt released at Ninilchik River, 1988–2006.

Release year	Brood year	Release date	Number of smolt[a]	Release location[b]	Hatchery	Mark type[c]	Percent adipose finclip[d]	Percent CWT	CWT tag code	Average length (mm)	Average weight (g)
1988	1987	7/6	248,586	Harbor	Fort Richardson	Ad, CWT	ND	12.5	311762	ND	12.5
1989	1988	6/1	200,203	Harbor	Fort Richardson	Ad, CWT	ND	9.4	311830	ND	11.8
1990	1989	5/30	215,804	Harbor/Brody	Fort Richardson	Ad, CWT	ND	18.7	311735	ND	12.8
1991	1990	5/22	87,992	Brody	Fort Richardson	Ad, CWT	ND	23.9	311934	100	12.0
1992	1991	5/28	132,387	Brody	Fort Richardson	Ad, CWT	ND	31.2	312104	107	12.5
1993	1992	6/8	184,585	Brody	Fort Richardson	Ad, CWT	ND	23.3	312159	107	14.7
1994	1993	5/31	201,513	Brody	Fort Richardson	Ad, CWT	ND	22.6	312318	ND	12.0
1995	1994	5/31	54,662	Harbor	Fort Richardson	Ad, CWT	ND	99.0	312435	ND	14.1
1996	1995	6/13	51,688	Harbor	Fort Richardson	Ad, CWT	ND	98.4	312515	ND	12.9
1997	1996	6/17	50,292	Brody	Fort Richardson	Ad, CWT, TM	ND	99.2	312608	ND	12.0
1998	1997	6/15	48,798	Brody	Fort Richardson	Ad, CWT, TM	ND	97.3	312635	ND	11.4
1999	1998	6/15	49,853	Brody	Fort Richardson	Ad, CWT, TM	ND	98.1	310147	104	13.6
2000	1999	6/2	51,298	Brody	Fort Richardson	Ad, CWT, TM	ND	97.5	310248	96	10.2
2001	2000	6/13	54,770	Brody	Fort Richardson	Ad, CWT, TM	ND	99.4	310260	104	13.6
2002	2001	6/14	54,631	Brody	Fort Richardson	Ad, CWT, TM	ND	99.1	310282	101	12.1
2003	2002	6/12	47,997	Brody	Fort Richardson	Ad, CWT, TM	ND	92.4	310256	105	12.6
2004	2002[e]	5/12	51,303	Brody	Fort Richardson	Ad, CWT, TM	ND	92.4	310193	105	12.6
2005	2003[e]	5/19	55,229	Brody	Fort Richardson	Ad, CWT, TM	ND	99.9	310318	101	11.9
2006	2004[e]	5/17	57,537	Brody	Fort Richardson	Ad, CWT, TM	99.2	99.4	310341	102	12.5
Average (1995-2005)			51,866					97.5		102.3	12.5

Note: ND = no data.

[a] Number released includes smolt that shed coded wire tags.

[b] Harbor = Ninilchik River harbor located at the mouth; Brody = Brody Road bridge; Harbor/Brody = 50% released in Ninilchik River harbor and 50% released at Brody Road bridge.

[c] Ad = adipose finclip; CWT = coded wire tag; TM = thermal mark.

[d] Smolt were checked prior to release for finclip quality starting in 2006.

[e] Smolt were released as freshwater-age-1 fish beginning in 2004.

Table 4.-Chinook salmon smolt released at Nick Dudiak Fishing Lagoon terminal saltwater fishery on Homer Spit, 2000–2006.

Nick Dudiak Fishing Lagoon							
Release year	Brood year	Release date	Number	Hatchery[a]	Mark type[b]	Average length (mm)	Average weight (g)
2000	1999	5/31	102,243	Elm.	NM	117	17.8
		6/7	117,741	Elm.	NM	119	17.8
2001	2000	5/25	101,799	Elm.	NM	104	13.9
		6/8	106,263	Elm.	NM	112	13.9
2002	2001	5/30	122,444	Elm.	TM	102	12.1
		6/6	67,582	Elm.	TM	107	12.1
2003	2002	6/6	80,063	Fort R.	TM	104	12.0
		5/28	126,229	Fort R.	TM	102	12.0
2004	2002[c]	6/7	95,105	Fort R.	TM	109	13.9
		6/10	47,932	Fort R.	TM	109	13.9
	2003	6/10	25,706	Elm.	TM	112	15.6
2005	2003[c]	6/10	111,196	Fort R.	TM	107	13.0
		6/13	109,626	Fort R.	TM	104	13.0
2006	2004[c]	6/19	111,089	Fort R.	TM	107	13.2
		6/22	112,964	Fort R.	TM	107	13.2
Average (2000–2005)			202,322			108.2	13.9

Note: All smolt released at Nick Dudiak Fishing Lagoon were produced from the Ninilchik River egg-take project.

[a] Fort R. = Fort Richardson Hatchery; Elm. = Elmendorf Hatchery.

[b] NM = no mark; TM = thermal mark.

[c] Smolt were released as freshwater-age-1fish beginning in 2004.

Table 5.-Chinook salmon smolt released at Halibut Cove Lagoon terminal saltwater fishery, 1995–2006.

Halibut Cove Lagoon								
Release year	Brood year	Release date	Number[a]	Hatchery[b]	Mark type[c]	CWT tag code	Average length (mm)	Average weight (g)
1995	1994	6/13	37,577	Elm.	AD, CWT	312430	ND	23.6
1996	1995	6/4	97,729	Elm.	AD, CWT	312511	ND	18.5
1997	1996	6/9	78,133	Elm.	AD, CWT	312558	ND	13.4
1998	1997	6/12	65,893	Elm.	AD, CWT	312632	114	17
1999	1998	6/1	79,221	Elm.	NM		114	16.7
2000	1999	6/1	83,277	Elm.	NM		114	16.5
2001	2000	6/5	106,719	Elm.	NM		104	15.7
2002	2001	5/28	106,279	Elm.	TM		104	12.7
2003	2002	6/17	106,844	Fort R.	TM		104	12.5
2004	2002[d]	6/4	103,771	Fort R.	TM		107	13.6
2005	2003[d]	6/15	112,521	Fort R.	TM		107	13
2006	2004[d]	6/14	117,549	Fort R.	TM		102	11.7
Average (1995–2005)			88,906				108.6	15.7

Note: All smolt released at Halibut Cove Lagoon were produced from the Ninilchik River egg-take project. ND =no data collected.

[a] Number released includes smolts that had shed their coded wire tags.

[b] Fort R. = Fort Richardson Hatchery; Elm. = Elmendorf Hatchery

[c] Ad = adipose finclip; CWT = coded wire tag; TM = thermal mark; NM = no mark.

[d] Smolt were released as freshwater-age-1 fish beginning in 2004.

Table 6.-Chinook salmon smolt released at Seldovia Bay terminal saltwater fishery, 1996–2006.

Seldovia Bay								
Release year	Brood year	Release date	Number of smolt[a]	Hatchery[b]	Mark type[c]	CWT tag code	Average length (mm)	Average weight (g)
1996	1995	6/12	118,274	Elm.	AD, CWT	312510	ND	18.2
1997	1996	6/6	103,757	Elm.	AD, CWT	312557	ND	13.6
1998	1997	6/9	69,461	Elm.	AD, CWT	312631	109	13.8
1999	1998	5/28	74,057	Elm.	NM		117	17.6
2000	1999	6/6	68,114	Elm.	NM		119	19.2
2001	2000	6/7	102,793	Elm.	NM		109	14.2
2002	2001	5/28	83,045	Elm.	TM		107	13.4
2003	2002	6/11	107,521	Fort R.	TM		102	11.4
2004	2003	5/18	88,682	Elm.	TM		107	12.9
2005	2003[d]	6/7	114,984	Fort R.	TM		107	13.2
2006	2004[d]	5/30	113,974	Fort R.	TM		102	11.4
Average (1996–2005)			93,069				109.5	14.8

Note: All smolt released at Seldovia Bay were produced from the Ninilchik River egg-take project. ND = no data.

[a] Number released includes smolts that had shed their coded wire tags.

[b] Fort R. = Fort Richardson Hatchery; Elm. = Elmendorf Hatchery.

[c] Ad = adipose finclip; CWT = coded wire tag; TM = thermal mark; NM = no mark.

[d] Smolt were released as freshwater-age-1 fish beginning in 2005.

Table 7.-Wild and hatchery-reared Chinook salmon counts at Ninilchik River weir, 1994–2006.

	Wild Chinook salmon			Hatchery-reared Chinook salmon		
	Weir counts (no. of fish)			Weir counts (no. of fish)		
Year	July 8–24 subtotal[a]	Total run	Percent of run	July 8–24 subtotal[a]	Total run	Percent of run
1994	423			40		
1995	503			342		
1996	591			264		
1997	235			358		
1998	422			268		
1999	799	1,644	49	277	641	43
2000	834	1,634	51	426	853	50
2001	716	1,414	51	363	673	54
2002	655	1,516	43	169	559	30
2003	393	1,258	31	150	425	35
2004	416	1,525	27	158	536	29
2005	814	2,241	36	129	462	28
2006	764			123		
Average (1999–2005)	661	1,605	41	239	593	39
SEG[b]	400-850					

[a] July 8–24 is the sustainable escapement goal (SEG) counting period.

[b] The SEG range was established in 2001 based on wild Chinook salmon counts at Ninilchik River weir from July 8–24, for 1994–2000.

Table 8.-Ninilchik River Chinook salmon weir data, 1989–1992 and 1994–2006.

Year	Weir operating dates	Chinook salmon run			Egg-take mortality (no. of Chinook salmon)	Coded wire tagged Chinook salmon		Chinook salmon escapement	
		Component	No. of fish	Percent		No. of fish recovered	No. of strays detected[a]	No. of fish[b]	Percent
1989	7/04 - 7/25	Total[c]	254		ND	ND	ND	ND	
1990	7/06 - 7/ 27	Total[c]	315		ND	ND	ND	ND	
1991	7/01 - 7/17	Total[c]	338		ND	12	ND	ND	
1992	6/30 - 7/14	Total[c]	539		ND	59	ND	ND	
1993	NL		NL	NL	NL	38	1	NL	NL
1994		Wild	446	81	ND	NA	NA	446	–
		Hatchery-reared	103[d]	19	ND	43	0	60	–
	7/07 - 7/26	Total[e]	549	100	125	43	0	381	
1995	7/04 - 8/01	Wild	725	63	ND	NA	NA	725	–
		Hatchery-reared	425[d]	37	ND	135	0	290	–
		Total[e]	1,150	100	194	135	0	821	
1996	7/02 - 7/24	Wild	654	69	ND	NA	NA	654	–
		Hatchery-reared	290[d]	31	ND	69	0	221	–
		Total[e]	944	100	190	69	0	685	
1997	7/01 - 8/11	Wild	579	53	ND	NA	NA	579	–
		Hatchery-reared	517[d]	47	ND	181	2	336	–
		Total[e]	1,096	100	132	181	2	783	
1998	7/03 - 8/01	Wild	536	53	ND	NA	NA	536	53
		Hatchery-reared	466[d]	47	ND	0	0	466	47
		Total	1,002	100	196	0	0	1,002	

-continued-

Table 8.-Page 2 of 2.

Year	Weir operating dates	Chinook salmon run: Component	Chinook salmon run: No. of fish	Chinook salmon run: Percent	Egg-take mortality (no. of Chinook salmon)	Coded wire tagged Chinook salmon: No. of fish recovered	Coded wire tagged Chinook salmon: No. of strays detected[a]	Chinook salmon escapement: No. of fish[b]	Chinook salmon escapement: Percent
1999	5/18 - 8/13	Wild	1,644	72	68	NA	NA	1,576	73
		Hatchery-reared	641	28	26	42		573	27
		Total[f]	2,285	100	94	42	0	2,149	
2000	5/17 - 8/08	Wild	1,634	66	81	NA	NA	1,553	69
		Hatchery-reared	853	34	60	108	1	685	31
		Total	2,487	100	141	108	1	2,238	
2001	5/30 -8/05	Wild	1,414	68	175	NA	NA	1,239	70
		Hatchery-reared	673	32	0	130		543	30
		Total	2,087	100	175	130	0	1,782	
2002	5/23 -8/11	Wild	1,516	73	176	NA	NA	1,340	77
		Hatchery-reared	559	27	55	109		395	23
		Total	2,075	100	231	109	0	1,735	
2003	5/16 -8/05	Wild	1,258	75	131	NA	NA	1,127	77
		Hatchery-reared	425	25	52	37	5	336	23
		Total	1,683	100	183	37	5	1,463	
2004	5/18 -8/05	Wild	1,525	74	132	NA	NA	1,393	75
		Hatchery-reared	536	26	0	67	1	469	25
		Total	2,061	100	132	67	1	1,862	
2005	5/06 -8/04	Wild	2,241	83	165	NA	NA	2,076	84
		Hatchery-reared	462	17	0	53	0	409	16
		Total	2,703	100	165	53	0	2,485	
2006	6/30-8/01	Wild	1,139	81	101	–	–	1,038	84
		Hatchery-reared	273	19	35	34	1	204	16
		Total	1,412	100	136	34	1	1,242	100
Average (1999–2005)		Wild	1,605	73	133	–	–	1,472	75
		Hatchery-reared	593	27	28	78	1	487	25
		Total	2,197	100	160	78	1	1,959	100

Note: "NL" = no data located; "ND" = no data; "-" = value cannot be computed due to limitations of the data; "NA" = not applicable.

[a] Number of Chinook salmon strays from other drainages that were recovered in Ninilchik River. Note: the number of strays are included in the coded wire tag (CWT) recovered total.

[b] Escapement = [total run - (egg take mortality + CWT recovered)].

[c] Number of wild and hatchery-reared Chinook salmon used in egg take unavailable; therefore total escapement does not account for mortality.

[d] Number of hatchery-reared Chinook salmon in the weir counts was expanded by the percent of CWT fish.

[e] Number of wild and hatchery Chinook salmon used in egg take unavailable.

[f] Run includes the 31 wild and 38 hatchery-reared Chinook salmon that were captured in nets below the weir.

Table 9.-Average, maximum, and minimum water temperature and discharge for the Ninilchik River during the SEG index monitoring period, July 8–24, 1999–2006.

	Ninilchik River					
	Water temperature (^{o}C)			Discharge (ft^{3}/s)		
Year	Average	Maximum	Minimum	Average	Maximum	Minimum
1999	ND	ND	ND	61	95	50
2000	12	15	10	108	194	64
2001	12	13	11	101	197	58
2002	14	16	13	93	147	72
2003	16	17	14	407	454	382
2004	14	17	12	63	73	54
2005	14	16	13	68	99	60
2006	12	16	9	84	113	73
(1999–2005)						
Average	14	16	12	129	180	106
Minimum	12	13	10	61	73	50
Maximum	16	17	14	407	454	382

Source: Temperature data collected at the NR-2 site by Sue Mauger of Cook Inletkeeper; provisional discharge data collected by the National Weather Service Alaska Pacific Weather Forecast Center.

Note: ND = no data.

Table 10.-Estimated ocean age composition and length-at-ocean age of wild and hatchery-reared Chinook salmon run at Ninilchik River weir, 2006.

	Wild Chinook salmon							Hatchery-reared Chinook salmon						
		Ocean age					Sex		Ocean age					Sex
	UR[a]	1	2	3	4	Total	composition[b]	UR[a]	1	2	3	4	Total	composition[b]
Females														
Number sampled[c]	13	0	10	35	24		528	0	0	4	13	7		110
Estimated percent		0.0	7.1	25.0	17.1		46.5		0.0	6.0	19.4	10.4		40.6
SE percent		0.0	2.1	3.4	3.0		0.1		0.0	2.5	4.2	3.3		0.3
Estimated abundance[d]		0	74	260	178	483			0	12	40	21	83	
SE abundance		0.0	21.2	35.7	31.1	0.9			0.0	5.2	8.6	6.7	0.5	
Mean length (mm)		NA	728	764	847	789			NA	668	705	826	730	
SE length (mm)		NA	10.9	5.4	7.2	5.9			NA	15.9	8.1	26.1	13.8	
Males														
Number sampled[c]	6	13	32	21	5		607	1	22	18	2	1		161
Estimated percent		9.3	22.9	15.0	3.6		53.5		32.8	26.9	3.0	1.5		59.4
SE percent		2.3	3.3	2.8	1.5		0.1		5.0	4.7	1.8	1.3		0.3
Estimated abundance[d]		96	237	156	37	555			67	55	6	3	121	
SE abundance		23.9	34.6	29.4	15.3	0.9			10.2	9.7	3.7	2.6	0.5	
Mean length (mm)		423	649	791	873	661			419	646	688	865	540	
SE length (mm)		22.2	10.0	13.2	25.2	15.8			5.3	12.5	2.2	NA	17.3	
Total														
Number sampled[c]	19	13	42	56	29		1,135	1	22	22	15	8		271
Estimated percent		9.3	30.0	40.0	20.7				32.8	32.8	22.4	11.9		
SE percent		2.3	3.6	3.9	3.2				5.0	5.0	4.5	3.5		
Estimated abundance[d]		96	311	415	215	1,038			67	67	46	24	204	
SE abundance		23.9	37.8	40.4	33.4				10.2	10.2	9.1	7.1		
Mean length (mm)		423	668	774	851				419	650	703	831		
SE length (mm)		22.2	9.4	6.2	7.4				5.3	10.6	7.1	22.6		

[a] UR = unreadable scale samples.

[b] All fish were examined to indentify sex but was not determined for 4 wild fish and 2 hatchery-reared fish.

[c] Number sampled for age and length data.

[d] Estimated abundances were calculated using the rounded estimated percent presented in this table.

Table 11.-Coded wire tag (CWT) data from hatchery-reared Chinook salmon recovered at Ninilchik River weir, 2006.

CWT	Brood	Smolt release		Adult recoveries[a]			Ocean age										
							CWT-age[b]		Scale- first ocean age estimate			Scale-second ocean age estimate			Scale- resolved ocean age estimate		
code	year	Date	Site	Female	Male	Total	Fresh	Ocean	Correctly[c]	Incorrect[d]	Unaged[e]	Correctly[c]	Incorrect[d]	Unaged[e]	Correctly[c]	Incorrect[d]	Unaged[e]
310282	2001	6/14/02	Ninilchik R.	14	0	14	0	4	10	2	2	11	1	2	12	0	2
310193	2002	6/12/03	Ninilchik R.	2	0	2	0	3	2	0	0	2	0	0	2	0	0
310256	2002	6/12/03	Ninilchik R.	12	1	13	0	3	8	2	3	9	2	2	11	0	2
310273	2002	6/05/03	Crooked Ck.	0	1	1	0	3	1	0	0	1	0	0	1	0	0
310318	2002	5/12/04	Ninilchik R.	4	9	13	1	2	12	1	0	11	2	0	12	1	0
310341	2003	5/19/05	Ninilchik R.	0	13	13	1	1	13	0	0	13	0	0	13	0	0
No tag[f]				2	3	5	–	–	–	–	–	–	–	–	–	–	–
Total				34	27	61			46	5	5	47	5	4	51	1	4

Note: "-" = value not applicable.

[a] Units = number of fish.

[b] Freshwater (fresh) and ocean ages were determined by comparing brood year, release year, and recovery year.

[c] Number of scale samples where age matched CWT age.

[d] Number of scale samples where age did not matched CWT age.

[e] Number of scale samples that were not aged due to illegible scales.

[f] CWT was not detected from these Chinook salmon samples with a missing adipose fin.

Table 12.-Ninilchik River Chinook salmon egg take dates, number of females spawned, fecundity and percent survival to the eyed stage, 1999–2006.

Year	Hatchery	Egg take date	Number of females spawned[a]	Maximum water temperature (°C)	Fecundity[b]		Green egg estimates at		Eyed eggs	
					Assumed	Actual	Egg take	Eyed stage	Total	% survival
1999	Fort Richardson	7-Jul	6	ND	6,000	6,399	36,000	38,396	34,707	90.4
1999	Fort Richardson	14-Jul	23	ND	6,000	6,380	138,000	146,734	124,751	85.0
1999	Fort Richardson	21-Jul	41	ND	6,000	6,179	246,000	253,329	217,827	86.0
1999	Fort Richardson	27-Jul	19	ND	6,000	5,630	114,000	106,970	98,492	92.1
Average			22		6,000	6,147	133,500	136,357	118,944	
Total			89				534,000	545,429	475,777	87.2
2000	Fort Richardson	7-Jul	8	14	5,591	5,533	44,726	44,267	35,496	80.2
2000	Fort Richardson	17-Jul	10	14	5,381	5,660	53,815	56,598	49,257	87.0
2000	Fort Richardson	24-Jul	36	12	5,421	5,663	195,174	203,876	161,326	79.1
2000	Fort Richardson	28-Jul	24	14	5,400	5,900	129,600	141,606	127,624	90.1
2000	Fort Richardson	28-Jul	41	14	5,400	5,794	221,400	237,536	214,659	90.4
Average			24	14	5,439	5,710	128,943	136,777	117,672	
Total			119				644,715	683,883	588,362	86.0
2001	Fort Richardson	10-Jul	7	14	5,793	5,680	40,551	39,757	26,050	65.5
2001	Fort Richardson	17-Jul	56	16	5,793	5,843	324,408	327,181	241,786	73.9
2001	Fort Richardson	25-Jul	42	15	5,793	6,365	243,306	267,331	237,211	88.7
Average			35	15	5,793	5,962	202,755	211,423	168,349	
Total			105				608,265	634,269	505,047	79.6
2002	Fort Richardson	12-Jul	6	18	6,000	5,852	36,000	35,109	21,112	60.1
2002	Fort Richardson	16-Jul	11	15	6,000	5,331	66,000	58,644	45,700	77.9
2002	Fort Richardson	23-Jul	12	14	6,000	5,937	72,000	71,241	60,738	85.3
2002	Fort Richardson	26-Jul	36	13	6,000	5,576	216,000	200,753	164,910	82.1
2002	Fort Richardson	30-Jul	32	18	6,000	5,771	192,000	184,672	162,332	87.9
2002	Fort Richardson	2-Aug	17	18	6,000	5,884	102,000	100,032	84,357	84.3
2002	Elmendorf	19-Jul	16	14	5,888	6,160	94,200	98,557	30,150	30.6
2002	Elmendorf	23-Jul	12	14	5,269	5,863	63,232	70,350	28,140	40.0
2002	Elmendorf	26-Jul	35	13	4,900	4,767	171,520	166,830	123,280	73.9
2002	Elmendorf	30-Jul	32	18	4,950	5,825	158,388	186,394	138,288	74.2
2002	Elmendorf	2-Aug	17	18	4,035	4,997	68,608	84,956	41,540	48.9
Average			21	16	5,549	5,633	112,723	114,322	81,868	
Total			226				1,239,948	1,257,538	900,547	71.6
2003	Fort Richardson	22-Jul	27	18	5,800	6,323	156,600	170,723	147,530	86.4
2003	Fort Richardson	29-Jul	55	13	5,800	6,240	319,000	343,177	293,695	85.6
2003	Fort Richardson	1-Aug	41	17	5,800	6,703	237,800	274,834	249,242	90.7
2003	Elmendorf	17-Jul	27	15	7,128	7,251	182,764	195,774	153,162	78.2
Average			38	16	6,132	6,629	224,041	246,127	210,907	
Total			150				896,164	984,508	843,629	85.7
2004	Fort Richardson	15-Jul	3	16	6,000	5,005	18,000	15,016	7,186	47.9
2004	Fort Richardson	20-Jul	26	14	6,000	5,941	156,000	154,461	110,634	71.6
2004	Fort Richardson	26-Jul	57	12	6,000	6,139	343,000	349,937	319,414	91.3
2004	Fort Richardson	30-Jul	40	13	6,000	5,396	240,000	215,859	195,000	90.3
Average			32	14	6,000	5,620	189,250	183,818	158,059	
Total			126				757,000	735,273	632,234	86.0
2005	Fort Richardson	20-Jul	14	16	5,811	4,968	81,354	69,550	56,165	80.8
2005	Fort Richardson	26-Jul	60	14	5,972	5,375	358,320	322,470	284,845	88.3
2005	Fort Richardson	2-Aug	31	12	5,972	5,365	185,132	166,324	154,087	92.6
Average			35	14	5,918	5,236	208,269	186,115	165,032	
Total			105				624,806	558,344	495,097	88.7
2006	Fort Richardson	19-Jul	44	11	5,858	6,359	279,796	267,527	229,151	86.0
2006	Fort Richardson	26-Jul	47	11	5,858	5,142	241,674	277,003	259,843	94.0
2006	Fort Richardson	1-Aug	11	12	5,858	4,295	47,245	51,845	49,200	95.0
Average			34	11	5,858	5,265	189,572	198,792	179,398	
Total			102				568,715	596,375	538,194	90.2
Average (1999–2005)			29	15	5,833	5,848	171,354	173,563	145,833	83.6

Note: ND = no data collected.

[a] Only ripe females were counted, and this number does not necessarily match the number of fish sacrificed during the egg take.

[b] Number of green eggs per female.

Table 13.-Inriver roving survey counts of Ninilchik River wild and hatchery-reared Chinook salmon (jacks included) sport harvest and catch for three regulatory 3-day weekend openings, 2006.

				Chinook salmon (jacks included)									
				Harvest					Catch				
				Wild		Hatchery			Wild		Hatchery		
Location[a]	3-day fishery opening	Sampling date	Hour	No.	%	No.	%	SE[b]	No.	%	No.	%	SE[b]
Reach 1	May 27-29	5/27	0-4	0	-	0	-	-	0	-	0	-	-
		5/27	4-8	8	88.9	1	11.1	11.1	11	84.6	2	15.4	10.4
		5/28	4-8	2	66.7	1	33.3	33.3	3	75.0	1	25.0	25.0
		5/29	4-8	10	76.9	3	23.1	12.2	13	81.3	3	18.8	10.1
	Subtotal			20	80.0	5	20.0	8.2	27	81.8	6	18.2	6.8
	June 3-5	6/3	0-4	3	37.5	5	0.0	18.3	3	37.5	5	0.0	18.3
		6/3	4-8	19	44.2	24	55.8	7.7	21	45.7	25	54.3	7.4
		6/4	4-8	5	71.4	2	28.6	18.4	5	71.4	2	28.6	18.4
		6/5	4-8	7	70.0	3	30.0	15.3	7	70.0	3	30.0	15.3
	Subtotal			34	50.0	34	50.0	6.1	36	50.7	35	49.3	6.0
	June 10-12	6/10	0-4	4	80.0	1	0.0	20.0	5	83.3	1	16.7	16.7
		6/10	4-8	24	42.1	33	57.9	6.6	33	46.5	38	53.5	6.0
		6/11	4-8	9	56.3	7	43.8	12.8	9	52.9	8	47.1	12.5
		6/12	4-8	6	100.0	0	0.0	0.0	6	100.0	0	0.0	0.0
	Subtotal			43	51.2	41	48.8	5.5	53	53.0	47	47.0	5.0
	Total			97	54.8	80	45.2	3.8	116	56.9	88	43.1	3.5
Reach 2	May 27-29	5/27	0-4	2	100.0	0	0.0	0.0	2	100.0	0	0.0	0.0
		5/27	4-8	15	75.0	5	25.0	9.9	16	76.2	5	23.8	9.5
		5/28	4-8	2	100.0	0	0.0	0.0	4	100.0	0	0.0	0.0
		5/29	4-8	5	50.0	5	50.0	16.7	6	54.5	5	45.5	15.7
	Subtotal			24	70.6	10	29.4	7.9	28	73.7	10	26.3	7.2
	June 3-5	6/3	0-4	10	62.5	6	37.5	12.5	13	61.9	8	38.1	10.9
		6/3	4-8	10	66.7	5	33.3	12.6	13	68.4	6	31.6	11.0
		6/4	4-8	6	85.7	1	14.3	14.3	15	93.8	1	6.3	6.3
		6/5	4-8	3	100.0	0	0.0	0.0	5	83.3	1	16.7	16.7
	Subtotal			29	70.7	12	29.3	7.2	46	74.2	16	25.8	5.6
	June 10-12	6/10	0-4	11	52.4	10	47.6	11.2	13	56.5	10	43.5	10.6
		6/10	4-8	18	75.0	6	25.0	9.0	27	79.4	7	20.6	7.0
		6/11	4-8	6	85.7	1	14.3	14.3	7	87.5	1	12.5	12.5
		6/12	4-8	4	57.1	3	42.9	20.2	9	75.0	3	25.0	13.1
	Subtotal			39	66.1	20	33.9	6.2	56	72.7	21	27.3	5.1
	Total			92	68.7	42	31.3	4.0	130	73.4	47	26.6	3.3
Reachs 1 and 2 combined	May 27-29	5/27	0-4	2	100.0	0	0.0	0.0	2	100.0	0	0.0	0.0
		5/27	4-8	23	79.3	6	20.7	7.7	27	79.4	7	20.6	7.0
		5/28	4-8	4	80.0	1	20.0	20.0	7	87.5	1	12.5	12.5
		5/29	4-8	15	65.2	8	34.8	10.2	19	70.4	8	29.6	9.0
	Subtotal			44	74.6	15	25.4	5.7	55	77.5	16	22.5	5.0
	June 3-5	6/3	0-4	13	54.2	11	45.8	10.4	16	55.2	13	44.8	9.4
		6/3	4-8	29	50.0	29	50.0	6.6	34	52.3	31	47.7	6.2
		6/4	4-8	11	78.6	3	21.4	11.4	20	87.0	3	13.0	7.2
		6/5	4-8	10	76.9	3	23.1	12.2	12	75.0	4	25.0	11.2
	Subtotal			63	57.8	46	42.2	4.8	82	61.7	51	38.3	4.2
	June 10-12	6/10	0-4	15	57.7	11	42.3	9.9	18	62.1	11	37.9	9.2
		6/10	4-8	42	51.9	39	48.1	5.6	60	57.1	45	42.9	4.9
		6/11	4-8	15	65.2	8	34.8	10.2	16	64.0	9	36.0	9.8
		6/12	4-8	10	76.9	3	23.1	12.2	15	83.3	3	16.7	9.0
	Subtotal			82	57.3	61	42.7	4.2	109	61.6	68	38.4	3.7
	Total			189	60.8	122	39.2	2.8	246	64.6	135	35.4	2.5

Note: "jacks" = ocean-age-1 Chinook salmon, total length <500 mm. "-" = value cannot be calculated due to limitations of the data.

[a] Reach 1 (Ninilchik River mouth to Beach Access Road bridge [RKM 1.25]). Reach 2 (Beach Access Road bridge to upstream ADF&G regulatory marker [RKM 3.2]).

[b] Binomial proportion; standard error estimates apply to both wild and hatchery estimates.

Table 14.-Inriver roving survey counts of Ninilchik River wild and hatchery-reared Chinook salmon (jacks excluded) sport harvest and catch for three regulatory 3-day weekend openings, 2006.

				Chinook salmon (jacks excluded)									
				Harvest					Catch				
	3-day fishery	Sampling		Wild		Hatchery			Wild		Hatchery		
Location[a]	opening	date	Hour	No.	%	No.	%	SE[b]	No.	%	No.	%	SE[b]
Reach 1	May 27-29	5/27	0-4	0	-	0	-	-	0	-	0	-	-
		5/27	4-8	7	87.5	1	12.5	12.5	10	83.3	2	16.7	11.2
		5/28	4-8	2	66.7	1	33.3	33.3	3	75.0	1	25.0	25.0
		5/29	4-8	10	83.3	2	16.7	11.2	13	86.7	2	13.3	9.1
	Subtotal			19	82.6	4	17.4	8.1	26	83.9	5	16.1	6.7
	June 3-5	6/3	0-4	3	100.0	0	0.0	0.0	3	100.0	0	0.0	0.0
		6/3	4-8	16	66.7	8	33.3	9.8	18	69.2	8	30.8	9.2
		6/4	4-8	5	83.3	1	16.7	16.7	5	83.3	1	16.7	16.7
		6/5	4-8	7	77.8	2	22.2	14.7	7	77.8	2	22.2	14.7
	Subtotal			31	73.8	11	26.2	6.9	33	75.0	11	25.0	6.6
	June 10-12	6/10	0-4	4	100.0	0	0.0	0.0	5	100.0	0	0.0	0.0
		6/10	4-8	23	59.0	16	41.0	8.0	31	59.6	21	40.4	6.9
		6/11	4-8	9	60.0	6	40.0	13.1	9	56.3	7	43.8	12.8
		6/12	4-8	5	100.0	0	0.0	0.0	5	100.0	0	0.0	0.0
	Subtotal			41	65.1	22	34.9	6.1	50	64.1	28	35.9	5.5
	Total			91	71.1	37	28.9	4.0	109	71.2	44	28.8	3.7
Reach 2	May 27-29	5/27	0-4	2	100.0	0	0.0	0.0	2	100.0	0	0.0	0.0
		5/27	4-8	15	75.0	5	25.0	9.9	16	76.2	5	23.8	9.5
		5/28	4-8	2	100.0	0	0.0	0.0	4	100.0	0	0.0	0.0
		5/29	4-8	3	42.9	4	57.1	20.2	3	42.9	4	57.1	20.2
	Subtotal			22	71.0	9	29.0	8.3	25	73.5	9	26.5	7.7
	June 3-5	6/3	0-4	10	62.5	6	37.5	12.5	13	61.9	8	38.1	10.9
		6/3	4-8	9	64.3	5	35.7	13.3	12	66.7	6	33.3	11.4
		6/4	4-8	6	85.7	1	14.3	14.3	15	93.8	1	6.3	6.3
		6/5	4-8	3	100.0	0	0.0	0.0	5	83.3	1	16.7	16.7
	Subtotal			28	70.0	12	30.0	7.3	45	73.8	16	26.2	5.7
	June 10-12	6/10	0-4	11	52.4	10	47.6	11.2	13	56.5	10	43.5	10.6
		6/10	4-8	18	75.0	6	25.0	9.0	27	79.4	7	20.6	7.0
		6/11	4-8	5	100.0	0	0.0	0.0	6	100.0	0	0.0	0.0
		6/12	4-8	4	57.1	3	42.9	20.2	9	75.0	3	25.0	13.1
	Subtotal			38	66.7	19	33.3	6.3	55	73.3	20	26.7	5.1
	Total			88	68.8	40	31.3	4.1	125	73.5	45	26.5	3.4
Reachs 1 and 2 combined	May 27-29	5/27	0-4	2	100.0	0	0.0	0.0	2	100.0	0	0.0	0.0
		5/27	4-8	22	78.6	6	21.4	7.9	26	78.8	7	21.2	7.2
		5/28	4-8	4	80.0	1	20.0	20.0	7	87.5	1	12.5	12.5
		5/29	4-8	13	68.4	6	31.6	11.0	16	72.7	6	27.3	9.7
	Subtotal			41	75.9	13	24.1	5.9	51	78.5	14	21.5	5.1
	June 3-5	6/3	0-4	13	68.4	6	31.6	11.0	16	66.7	8	33.3	9.8
		6/3	4-8	25	65.8	13	34.2	7.8	30	68.2	14	31.8	7.1
		6/4	4-8	11	84.6	2	15.4	10.4	20	90.9	2	9.1	6.3
		6/5	4-8	10	83.3	2	16.7	11.2	12	80.0	3	20.0	10.7
	Subtotal			59	72.0	23	28.0	5.0	78	74.3	27	25.7	4.3
	June 10-12	6/10	0-4	15	60.0	10	40.0	10.0	18	64.3	10	35.7	9.2
		6/10	4-8	41	65.1	22	34.9	6.1	58	67.4	28	32.6	5.1
		6/11	4-8	14	70.0	6	30.0	10.5	15	68.2	7	31.8	10.2
		6/12	4-8	9	75.0	3	25.0	13.1	14	82.4	3	17.6	9.5
	Subtotal			79	65.8	41	34.2	4.3	105	68.6	48	31.4	3.8
	Total			179	69.9	77	30.1	2.9	234	72.4	89	27.6	2.5

Note: "jacks" = ocean-age-1 Chinook salmon, total length <500 mm. "-" = value cannot be calculated due to limitations of the data.

[a] Reach 1 (Ninilchik River mouth to Beach Access Road bridge [RKM 1.25]). Reach 2 (Beach Access Road bridge to upstream ADF&G regulatory marker [RKM 3.2]).

[b] Binomial proportion; standard error estimates apply to both wild and hatchery estimates.

Table 15.-Weighted percent of the Ninilchik River combined wild and hatchery-reared Chinook salmon harvests for three regulatory 3-day weekend openings, 2006.

3-day fishery opening	Sampling dates	Effort (no. of anglers)[a]	Harvest (no. of fish)[b]	Weighted percent	SE percent
May 27-29	5/27	75	15		
	5/29	35	5		
	Total	99	20	33.3	10.8
June 3-5	6/3	36	15		
	6/5	11	1		
	Total	47	16	26.7	11.4
June 10-12	6/10	25	17		
	6/12	17	7		
	Total	42	24	40.0	10.2

[a] Number of anglers observed near the Sterling Highway bridge during weighted survey.

[b] Number of Chinook salmon including jacks harvested near the Sterling Highway bridge during weighted survey.

Table 16.-Ninilchik River wild and hatchery-reared Chinook salmon (jacks included) inriver harvest and catch reported in freshwater sport fish guide logbooks for regulatory and emergency order fisheries openings, 2006.

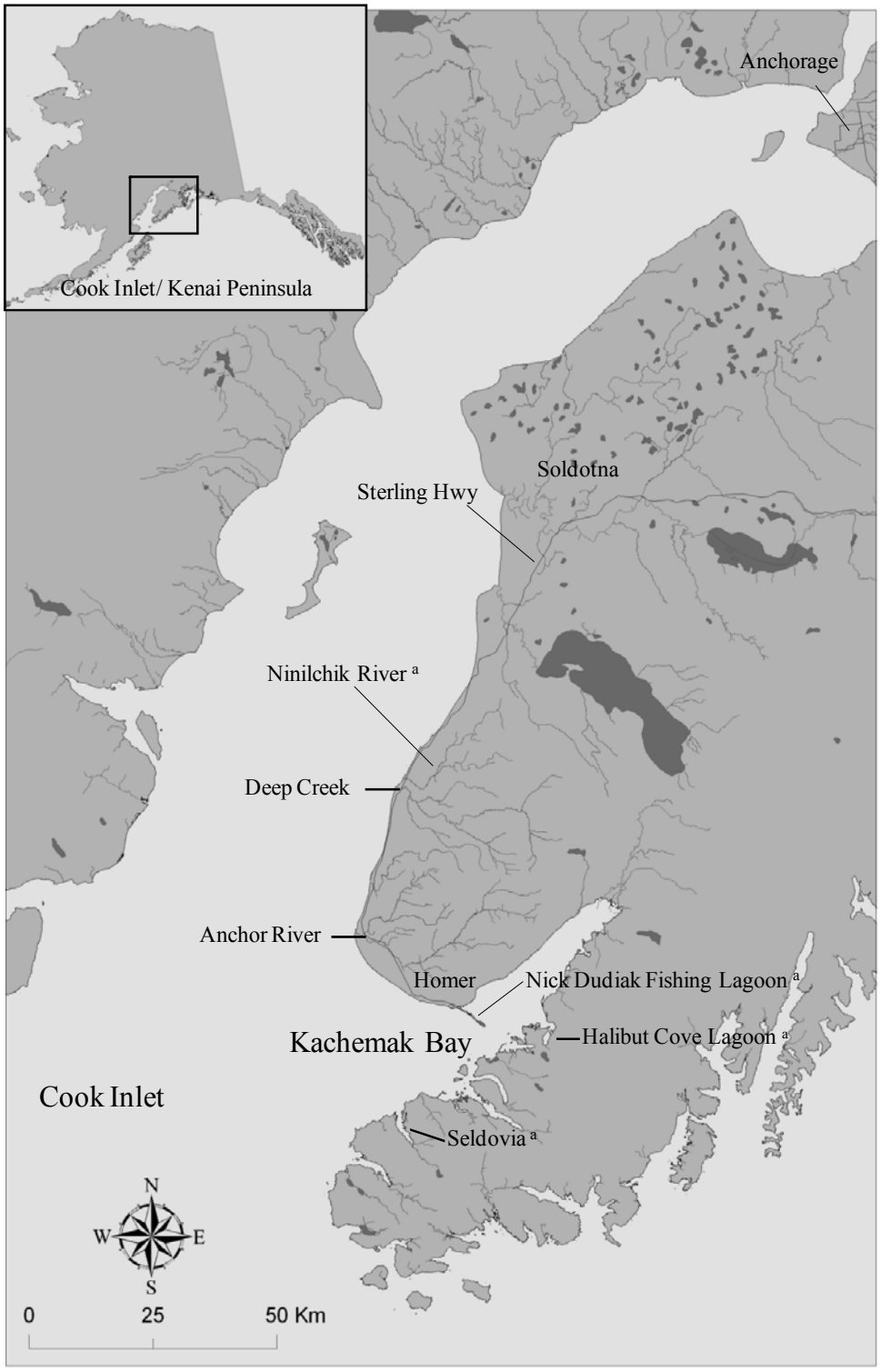
			Chinook salmon (jacks excluded)									
			Harvest					Catch				
Fishery			Wild		Hatchery-reared			Wild		Hatchery-reared		
opened by:	Dates	Anglers	Number	Percent	Number	Percent	SE[a]	Number	Percent	Number	Percent	SE[a]
Regulation	5/27-5/29	24	7	87.5	1	12.5	12.5	7	87.5	1	12.5	12.5
	6/3-6/5	25	11	61.1	7	38.9	11.8	27	79.4	7	20.6	7.0
	6/10-6/12	25	12	80.0	3	20.0	10.7	28	90.3	3	9.7	5.4
	Subtotal	74	30	73.2	11	26.8	7.0	62	84.9	11	15.1	4.2
Emergency	6/15-6/21	46	0	0.0	21	100.0	0.0	79	76.7	24	23.3	4.2
Order[b]	6/22-6/28	34	0	0.0	17	100.0	0.0	64	74.4	22	25.6	4.7
	6/29-7/5	33	0	0.0	10	100.0	0.0	40	75.5	13	24.5	6.0
	7/6-7/14	52	0	0.0	6	100.0	0.0	34	69.4	15	30.6	6.7
	Subtotal	165	0	0.0	54	100.0	0.0	217	74.6	74	25.4	2.6

Note: "jacks" = ocean-age-1 Chinook salmon, total length <500 mm.

[a] Binomial proportion; standard error estimates apply to both wild and hatchery estimates.

[b] Closed to the harvest of wild Chinook salmon.

FIGURES



[a] Stocking locations for hatchery-reared Ninilchik River Chinook salmon smolt.

Figure 1.-Kenai Peninsula highway system, Ninilchik River, and Kachemak Bay Chinook salmon stocking locations, 1999-2006.

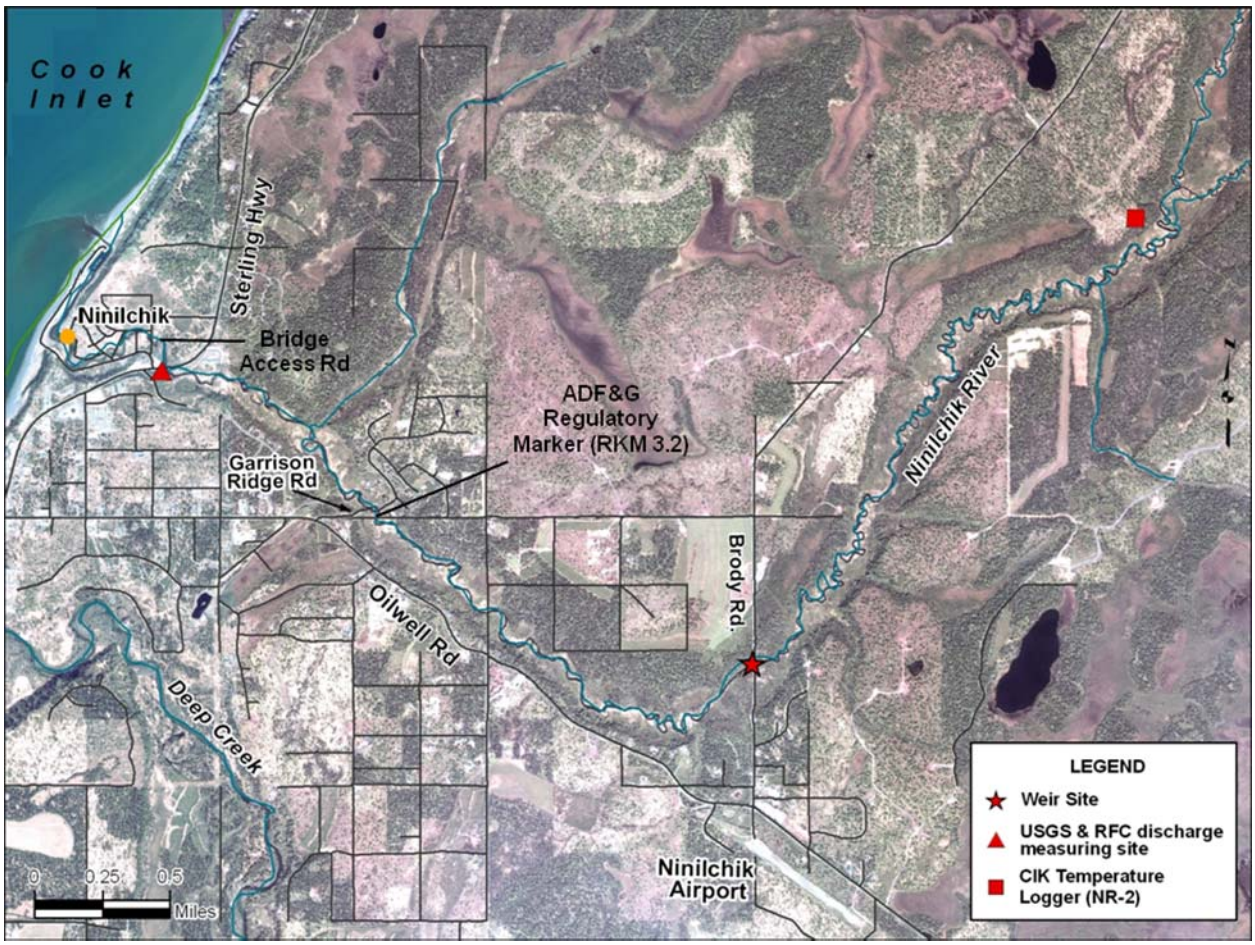


Figure 2.-Ninilchik River weir sampling locations, 2006.

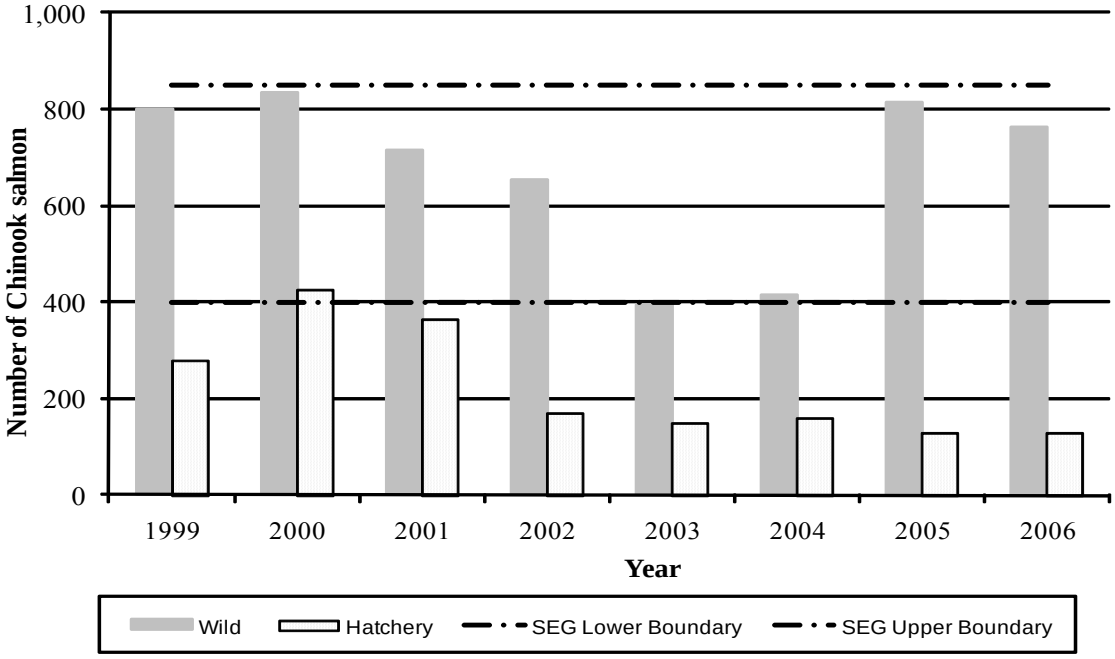
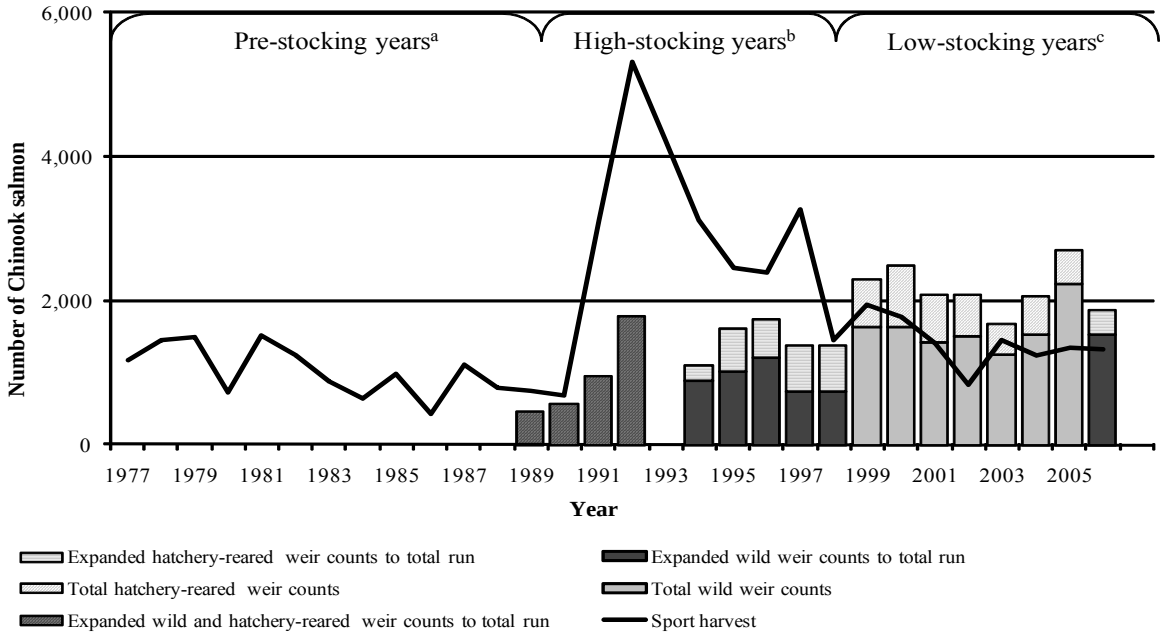


Figure 3.-Comparison of Ninilchik River Chinook salmon weir counts during the sustainable escapement goal (SEG) index monitoring period (July 8–24) with the upper and lower boundaries of the SEG range, 1999–2006.



[a] Years before the stocking program and the effect of stocking was realized from the adult Chinook salmon return.

[b] Years when adult Chinook salmon returned from the release of approximately 200,000 smolts.

[c] Years when the adult Chinook salmon returned from the reduced stocking level of approximately 50,000 smolts.

Figure 4.-Comparison of Ninilchik River Chinook salmon sport harvest and weir counts and how each responded to higher and lower levels of stocking with hatchery-reared Chinook salmon smolt, 1977–2006.

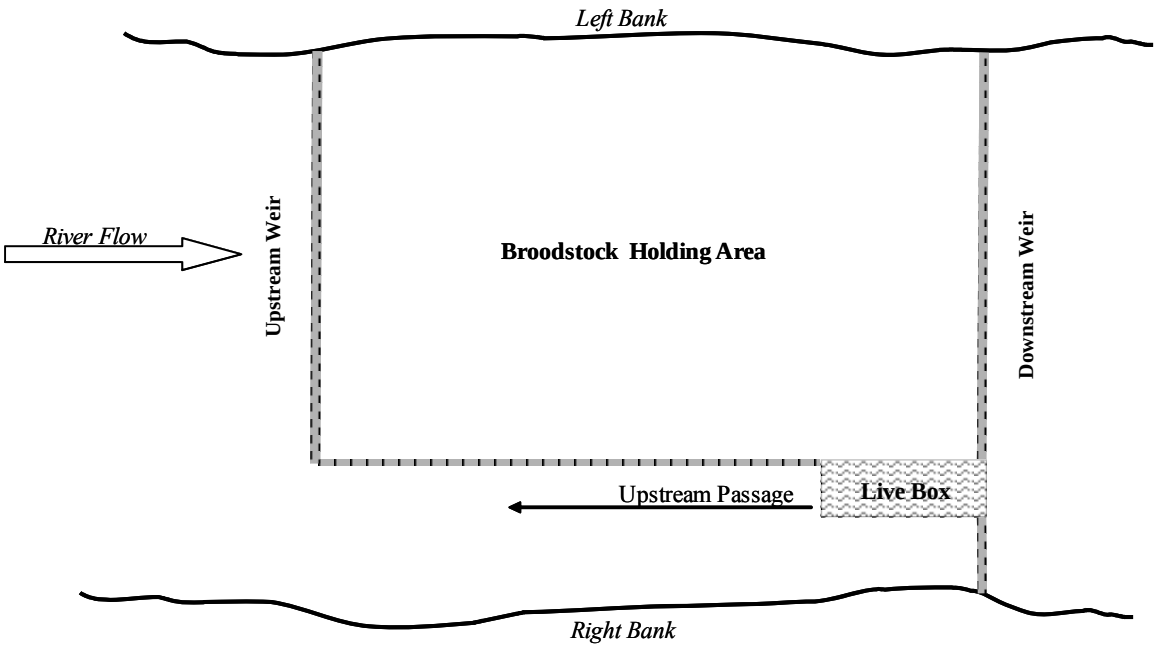


Figure 5.-The configuration of the Ninilchik River weirs and location of the broodstock holding area, 2006.

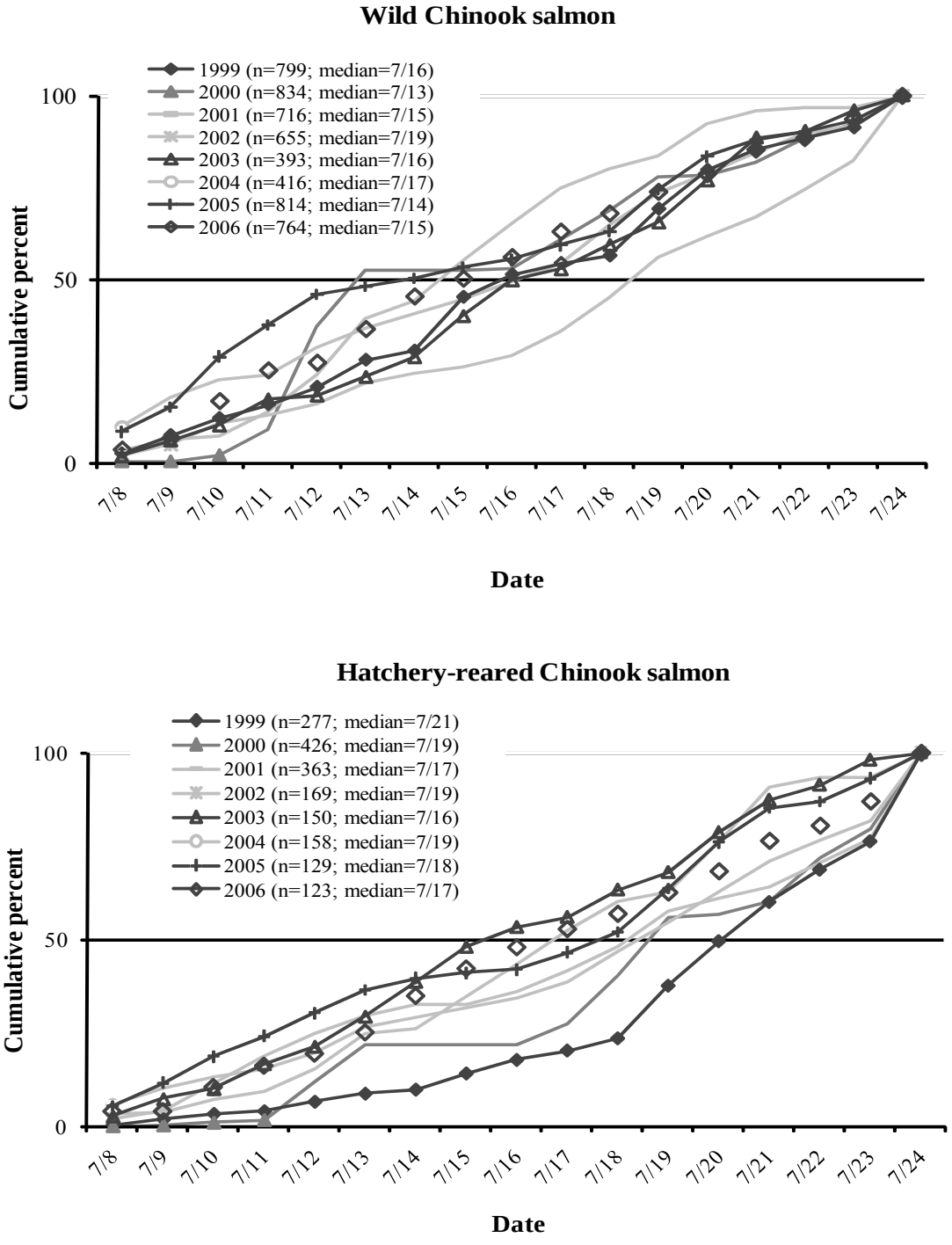


Figure 6.-Run timing cumulative percent of wild and hatchery components of the Ninilchik River Chinook salmon weir counts during the SEG index monitoring period (July 8–24), 1999–2006.

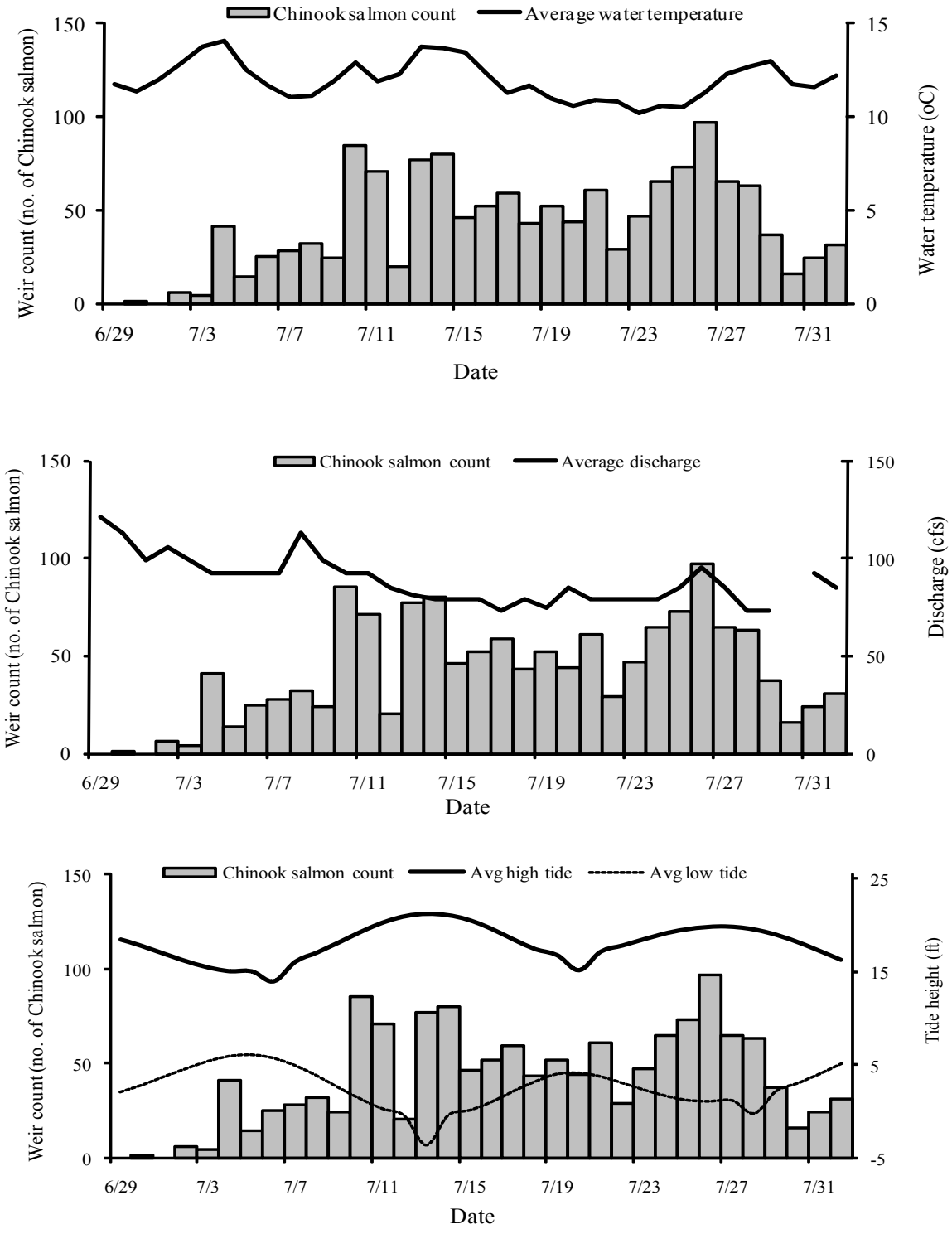


Figure 7.-Daily comparison of Ninilchik River Chinook salmon weir counts with average water temperature, discharge, and tide height for June 29 to August 1, 2006.

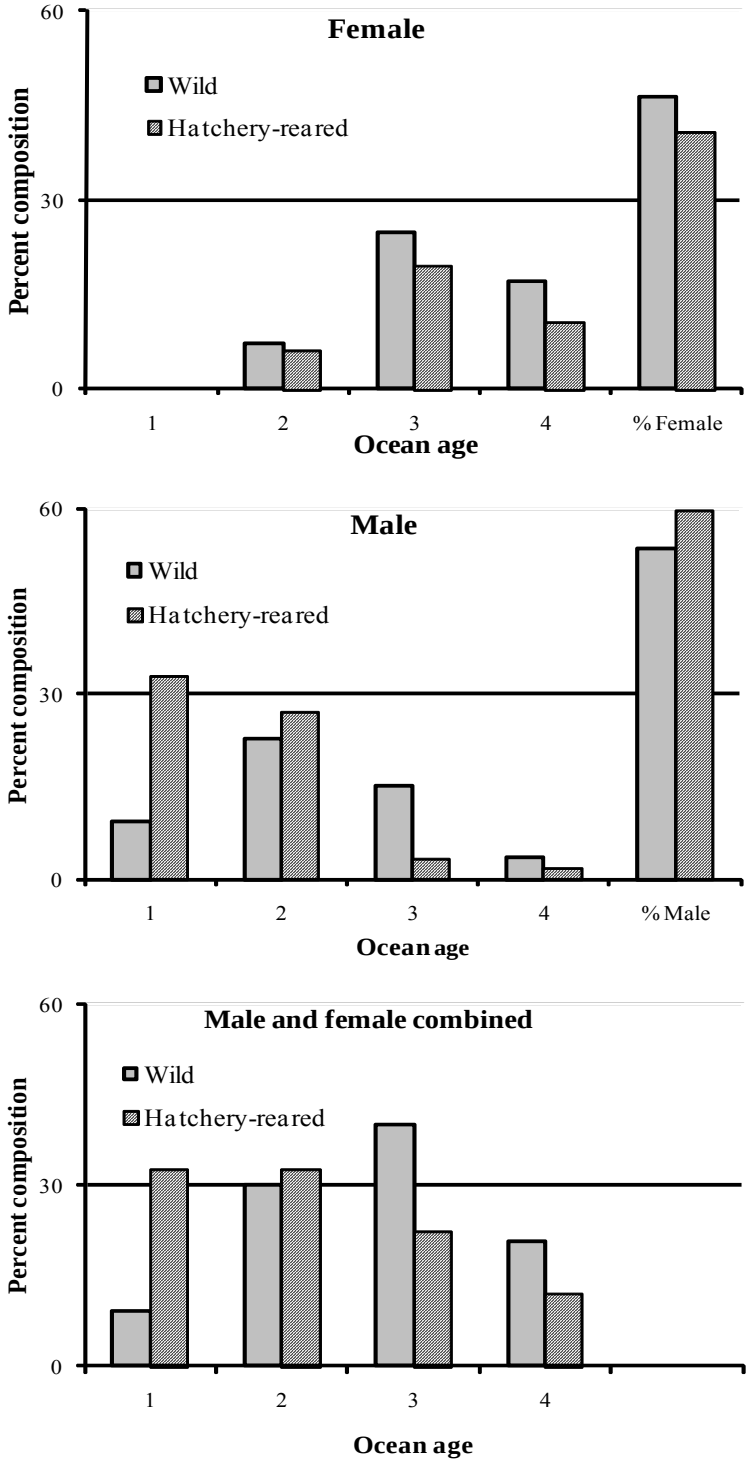
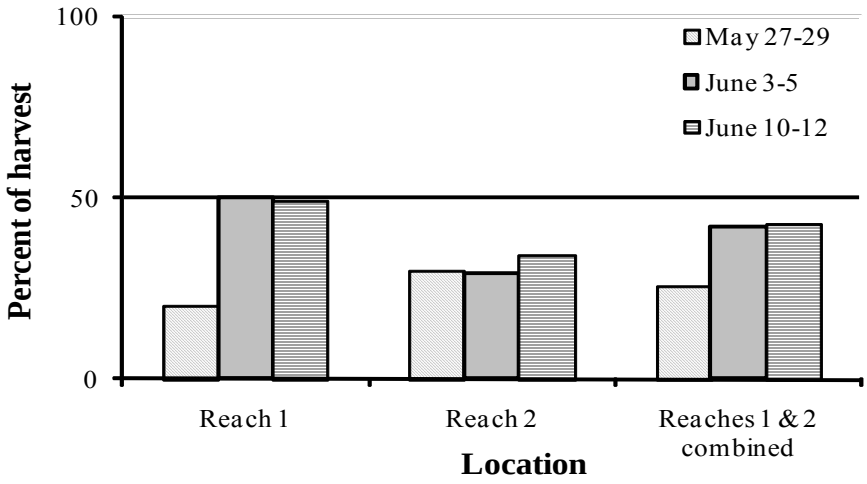


Figure 8.-The percent composition of wild and hatchery-reared components of Ninilchik River Chinook salmon run at Ninilchik River weir by sex and ocean age, 2006.



Note: Reach 1 = Ninilchik River mouth upstream to the beach access road bridge (RKM 1.25). Reach 2 = beach access road bridge upstream to the ADF&G regulatory marker (RKM 3.2).

Figure 9.-Percent of harvest by river reach and 3-day weekend openings for Ninilchik River hatchery-reared Chinook salmon (jacks included), 2006.

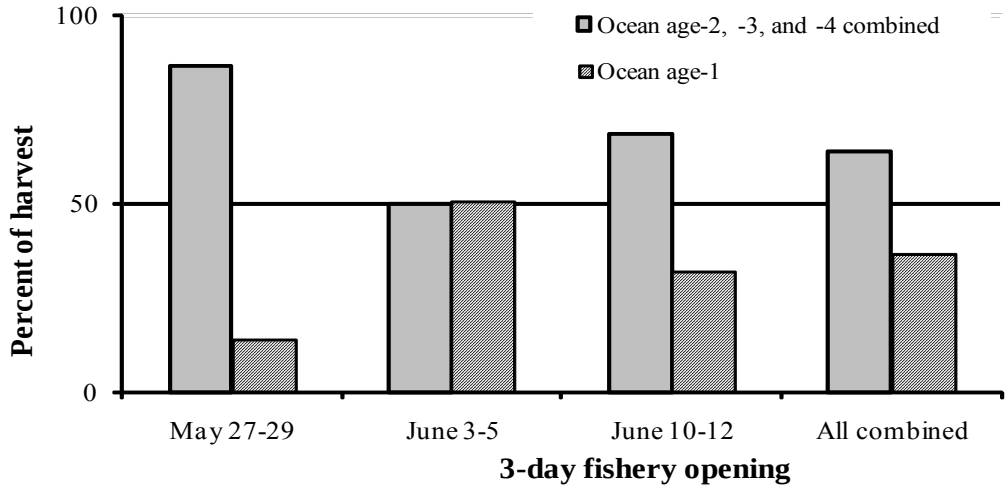


Figure 10.-Percent of harvest by 3-day weekend openings and ocean age for Ninilchik River hatchery-reared Chinook salmon, 2006.

APPENDIX A. MONITORING TIMELINES FOR NINILCHIK RIVER CHINOOK SALMON

Appendix A1.-Ninilchik River Chinook salmon supplementation program timeline.

Year(s)	**Supplementation**
1987	Supplementation program initiated with Ninilchik River Chinook salmon. Site selected at 7.7 river kilometers (RKM) (Brody Road bridge) upstream from the mouth of Ninilchik River for first egg take. The site was selected because of the availability of spawning Chinook salmon and it was accessible by road. Nets used to capture Chinook salmon for egg takes. Fertilized eggs transported to hatchery and reared to smolt.
1988	Egg take conducted in similar fashion to 1987. First year smolt were stocked into the Ninilchik River (~20% were adipose-clipped and coded-wire-tagged). All smolt were released in the harbor.
1989	Broodstock weir began operating only in July at Garrison Road bridge (~3 RKM) to capture Chinook salmon for egg takes; a seine was used to force fish into the trap because they refused to move upstream. A containment area was also created to hold fish so they could ripen. Fertilized eggs transported to hatchery and reared to smolt. Smolt released and quantity split equally between Brody Road bridge and Sterling Highway bridge.
1990–1992	Broodstock weir was moved upstream to Brody Road bridge (RKM 7.7) and operated only in July. A containment area was also created to hold fish so they could ripen. All smolt released at Brody Road bridge.
1993–1994	Genetic policy enacted to require that 60 wild pairs be spawned for Ninilchik River stocking. Separated wild from hatchery-reared fish for egg take. Broodstock weir, egg takes, and stocking conducted similar to 1990. All smolt released at Brody Road bridge.
1995–1998	Beginning in 1995, Ninilchik River stocking rate was reduced to ~ 50,000 smolt and coded wire tag (CWT) rate increased to 100%. In 1995 and 1996 smolt released in harbor, thereafter all Ninilchik River smolt released at Brody Road bridge. Program expanded to use smolt from Ninilchik River to support terminal saltwater fisheries in Kachemak Bay. Broodstock weir and egg takes were conducted similar to 1990.
1999–2005	100% of adult hatchery-reared Chinook salmon observed at the broodstock weir were visually indentified by an adipose finclip. Broodstock weir operated throughout the entire run with a holding area only established in July. Egg takes used hatchery-reared fish for saltwater stocking locations. Stocking was conducted similar to 1995. All Ninilchik River smolt released at Brody Road bridge.

Appendix A2.-Ninilchik River Chinook salmon escapement monitoring timeline.

Year(s)	Escapement monitoring
1962–1973	Annual Chinook salmon escapement estimated with a combination aerial and ground index survey. Survey conducted once annually over a standard length of river. Aerial surveys were done from a fixed-wing aircraft (super cub). Foot surveys were conducted in a subsection of the standard length from the Sterling Highway bridge upstream approximately 9 RKM (upstream of Brody Road). If the foot survey counts were greater than the aerial counts in the subsection, the total aerial count was expanded by the difference. No surveys conducted during several years because of poor viewing conditions.
1974	Aerial survey conducted with both fixed and rotary wing aircraft. Escapement estimate produced as in 1962–1973.
1976–1988	Subsection for ground survey reduced to 7.7 RKM above mouth at Brody Road bridge. Escapement estimate produced as in 1962–1973.
1975	Rotary wing aircraft replaces fixed wing aircraft as the viewing platform for all aerial surveys. Escapement estimate produced as in 1962–1973.
1989	In addition to the aerial and foot survey, escapement data opportunistically collected from broodstock weir located at Garrison Road bridge (approximately 3 RKM). Weir not operational throughout the entire run.
1990–1993	In addition to the aerial and foot survey, escapement data collected opportunistically from broodstock weir located at Brody Road bridge. No attempt made to identify and enumerate hatchery-reared fish. Weir not operational throughout the entire run.
1994	In addition to the aerial and foot survey, escapement counts at broodstock weir were used to estimate the number of wild and hatchery-reared Chinook salmon. The annual estimate of hatchery-reared Chinook salmon at the weir was estimated by expanding recovered CWTs at the weir. The wild counts were obtained by subtracting the hatchery-reared estimate from the total number of Chinook salmon counted at the broodstock weir. Weir not operational throughout the entire run.
1995–1998	Foot survey discontinued as a cost savings measure in 1995. Escapement data collected at broodstock weir as in 1994.
1999–2000	In addition to the aerial survey, broodstock weir operated over the entire Chinook salmon run. This was the first year that 100% of hatchery-reared fish were identified by their adipose finclip. Escapement counts of both wild and hatchery-reared fish enumerated by subtracting fish sacrificed for egg takes and CWT analysis.
2001–2005	Aerial survey discontinued as a cost savings measure in 2001. Escapement data collected at broodstock weir similar to 1999.

Appendix A3.-Ninilchik River Chinook salmon sport harvest monitoring and escapement goal timeline.

Year (s)	Sport Harvest
1977–present	Alaska Statewide Harvest Survey conducted to produce estimates of total catch and harvest for Chinook salmon in Ninilchik River.
1991–1993	Creel surveys of freshwater harvest were conducted to estimate the hatchery-reared Chinook salmon harvest.
1994–1996 and 2000–2003	Inriver harvest sampling was conducted to estimate the percentage of hatchery-reared Chinook salmon in the harvest.

Year (s)	Escapement Goals
1993–1997	First escapement goal adopted (Biological Escapement Goal [BEG] = 830 wild Chinook salmon) was based on average annual aerial and foot survey average counts and expanded estimates from 1966 to 1969 and 1977 to 1991.
1998	The Alaska Board of Fisheries (BOF) adopted a new BEG range of 500 to 900 wild Chinook salmon, which was based on historic aerial survey counts and their relationship to the sport harvest.
2001	Escapement Goal Policy adopted, and BEG was replaced with a Sustainable Escapement Goal (SEG) range of 400 to 850 wild Chinook salmon calculated from 7 years (1994 to 2000) of weir counts collected from July 8 through July 24.

Appendix A4.-Ninilchik River Chinook salmon freshwater fishing regulations and emergency orders timelines.

Year	Chinook salmon Fishing Regulations Assume the regulations are carried forward unless otherwise stated.
1977	Harvest recording requirement. Open period: four 2-day weekend openings beginning in the last week of May. Open area: mouth upstream 2 miles Season limit: of 5 Chinook salmon from fresh and salt water combined. Bag and size limit: 1 Chinook salmon 20" or larger; 10 Chinook salmon under 20"
1978	Open period changed to three 3-day weekend openings beginning in the last week of May.
1985	Bag and size limit: 1 Chinook salmon 16" or larger; 10 Chinook salmon under 16"
2001	Bag and size limit: 1 Chinook salmon 20" or larger; 10 Chinook salmon under 20"
2005	Bag and size limit: 2 Chinook salmon 20" or larger, of which only 1 can be wild; 10 Chinook salmon under 20" A person may not fillet, mutilate or otherwise disfigure a king salmon in a manner that prevents determination whether the fish is a wild or hatchery fish, until the person has stopped fishing in the Ninilchik River drainage for the day and has moved more than 100 yards away from the Ninilchik River.

Year	Emergency Orders
1991	E.O. added a fourth 3-day weekend opening (June 15, 16, 17) E.O. extended the fishery from June 17 to June 24
1992	E.O. extended fishery by 10 days
1993	E.O. opened the fishery continuously from June 15 through June 28.
1994	E.O. opened the fishery continuously from June 14 through June 27.
1995	E.O. extended fishery by 14 days.
1996	E.O. No. 2-KS-1-20-96 extended the Chinook salmon fishery on the Ninilchik River on a continual basis between Saturday, June 15 through Monday, June 24. Effective June 15, 12:01 AM through Monday June 24, 1996.
2001	E.O. No. 2-KS-7-05-02 opened the Ninilchik River downstream of the regulatory marker for an additional 3-day weekend opening, June 16, 2001, 12:01 AM to June 18, 2001, 11:59 PM.

Year	Emergency Orders
2002	E.O. No. 2-KS-7-08-02 opened the Ninilchik River to sport fishing for hatchery Chinook salmon only from its mouth to the downstream edge of the Sterling Highway bridge, from Saturday, June 15, 12:01 AM to Monday, June 17, 11:59 PM. The daily bag and possession limit was 1 fish 20 inches or greater in length or 10 fish under 20 inches. Only unbaited artificial lures were permitted.
2003	E.O. No. 2-KS-7-03-03 opened the Ninilchik River to sport fishing for hatchery Chinook salmon only from its mouth to the downstream edge of the Sterling Highway bridge, from Saturday, June 14, 2003, 12:01 AM to Monday, June 30, 2003, 11:59 PM. The daily bag and possession limit was 1 fish 20 inches or greater in length and 10 fish under 20 inches. Use of only one single hook was allowed.
2004	E.O. No. 2-KS-7-03-04 opened the Ninilchik River from its mouth upstream to the regulatory marker located approximately 2 miles upstream, to fishing for hatchery Chinook salmon 7 days per week. Bait was allowed. Only one, single hook could be used. A person could not possess a Chinook salmon that had been filleted, headed, mutilated or otherwise disfigured in a manner that prevented identification of hatchery or wild origin until permanently transported away from the fishing site if the fish was taken from the riverbank. "Fishing site" meant the riverbank where the fish was hooked and removed from the water. The emergency order was effective 12:01 AM, Saturday, May 29, 2004 until 11:59 PM December 31, 2004.
2006	E.O. No. 2-KS-7-12-06 opened the Ninilchik River from its mouth upstream to the regulatory markers located approximately 2 miles upstream, from Wednesday, June 14, 12:01 AM to Friday, July 14, 11:59 PM, to fishing for hatchery Chinook salmon. Hatchery Chinook salmon are recognized by the healed adipose finclip scar. Chinook salmon with an adipose fin shall not be removed from the water and must be released immediately. The daily bag and possession limit is 2 hatchery Chinook salmon 20 inches or greater in length and 10 hatchery Chinook salmon under 20 inches. Fish 20 inches or greater in length must be recorded on the back of the fishing license or harvest record card. Bait is allowed. Only one single hook may be fished.

APPENDIX B. NINILCHIK RIVER CHINOOK SALMON WEIR COUNTS, 2006

Appendix B1.-Daily and cumulative counts of wild and hatchery-reared Chinook salmon at Ninilchik River weir, 2006.

	Weir count (number of fish)								
	Wild Chinook salmon			Hatchery-reared Chinook salmn			Total Chinook salmon		
		Cumulative			Cumulative			Cumulative	
Date	Daily	Number	Percent	Daily	Number	Percent	Daily	Number	Percent
6/30	1	1	0	0	0	0	1	1	0
7/01	0	1	0	0	0	0	0	1	0
7/02	5	6	1	1	1	0	6	7	0
7/03	3	9	1	1	2	1	4	11	1
7/04	37	46	4	4	6	2	41	52	4
7/05	13	59	5	1	7	3	14	66	5
7/06	23	82	7	2	9	3	25	91	6
7/07	25	107	9	3	12	4	28	119	8
7/08 [a]	27	134	12	5	17	6	32	151	11
7/09 [a]	24	158	14	0	17	6	24	175	12
7/10 [a]	77	235	21	8	25	9	85	260	18
7/11 [a]	64	299	26	7	32	12	71	331	23
7/12 [a]	16	315	28	4	36	13	20	351	25
7/13 [a]	70	385	34	7	43	16	77	428	30
7/14 [a, b]	68	453	40	12	55	20	80	508	36
7/15 [a]	37	490	43	9	64	23	46	554	39
7/16 [a]	45	535	47	7	71	26	52	606	43
7/17 [a, c]	53	588	52	6	77	28	59	665	47
7/18 [a]	38	626	55	5	82	30	43	708	50
7/19 [a]	45	671	59	7	89	33	52	760	54
7/20 [a]	37	708	62	7	96	35	44	804	57
7/21 [a]	51	759	67	10	106	39	61	865	61
7/22 [a]	24	783	69	5	111	41	29	894	63
7/23 [a]	39	822	72	8	119	44	47	941	67
7/24 [a]	49	871	76	16	135	49	65	1,006	71
7/25	56	927	81	17	152	56	73	1,079	76
7/26	80	1,007	88	17	169	62	97	1,176	83
7/27	44	1,051	92	21	190	70	65	1,241	88
7/28	33	1,084	95	30	220	81	63	1,304	92
7/29	17	1,101	97	20	240	88	37	1,341	95
7/30	8	1,109	97	8	248	91	16	1,357	96
7/31	11	1,120	98	13	261	96	24	1,381	98
8/01	19	1,139	100	12	273	100	31	1,412	100

[a] Sustainable escapement goal (SEG) counting period.

[b] Median run timing date during the SEG counting period for wild Chinook salmon.

[c] Median run timing date during the SEG counting period for hatchery-reared Chinook salmon.

APPENDIX C. NINILCHIK RIVER WATER TEMPERATURE, DISCHARGE, AND TIDES, 2006

Appendix C1.-Ninilchik River daily mean, maximum, and minimum water temperatures, June 1 through October 4, 2006.

	Water temperatures (°C)														
	June			July			August			September			October		
Date	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum
1	11	10	11	12	10	14	12	11	14	8	7	9	4	4	5
2	10	7	12	13	10	16	11	10	12	8	8	9	5	5	5
3	11	9	13	14	12	16	10	9	11	9	8	10	6	5	6
4	11	9	13	14	12	16	10	9	11	8	7	9	5	5	6
5	10	8	11	13	12	14	11	9	13	8	8	9			
6	10	7	12	12	11	12	12	9	14	7	7	8			
7	9	8	11	11	11	12	12	10	14	7	6	8			
8	8	8	9	11	10	13	12	10	15	8	7	9			
9	8	7	10	12	10	14	12	11	13	8	7	9			
10	9	8	10	13	12	14	11	11	12	8	7	9			
11	9	8	9	12	11	13	11	10	11	8	6	9			
12	8	8	9	12	10	15	11	10	12	7	6	9			
13	9	7	9	14	11	16	11	11	12	7	5	8			
14	9	8	10	14	12	15	11	10	11	7	7	8			
15	9	9	10	13	12	15	10	10	10	7	7	7			
16	9	9	10	12	11	14	10	9	10	7	7	8			
17	9	8	10	11	10	12	10	9	11	7	7	8			
18	9	9	10	12	10	13	11	10	11	6	6	7			
19	9	8	10	11	9	12	11	10	11	6	6	7			
20	9	8	11	11	9	12	11	10	11	7	6	8			
21	10	8	12	11	10	12	10	9	11	6	6	7			
22	10	9	11	11	10	11	10	9	10	7	6	8			
23	9	8	10	10	9	11	9	8	10	8	7	8			
24	10	8	11	11	9	12	9	8	9	7	7	8			
25	10	9	12	11	10	11	9	8	10	6	5	7			
26	10	9	11	11	9	14	9	9	9	6	6	7			
27	10	8	13	12	10	15	9	8	11	7	6	7			
28	12	10	14	13	11	15	9	8	11	7	7	7			
29	12	11	13	13	11	15	9	8	10	7	6	7			
30	11	10	13	12	11	14	9	8	9	5	4	6			
31				12	10	14	8	8	9						

Source: Temperature data collected at the NR-2 site by Sue Mauger of Cook Inletkeeper.

Appendix C2.-Daily discharge measurements taken approximately 1.5 river kilometers upstream from the mouth of Ninilchik River, 2006.

	Discharge (ft^3/s)							
Date	April	May	June	July	August	September	October	November
1		465	113	99	85	261	234	73
2		465	113	106	106	187	210	68
3		506	113	99	106	166	166	63
4		760	113	92	92	147	166	67
5		845	99	92	92	129	147	147
6		–	99	92	92	177	138	388
7		733	85	92	81	166	129	
8		704	92	113	73	147	129	
9		506	106	99	79	129	166	
10		388	119	92	79	121	210	
11		425	166	92	85	121	166	
12		486	147	85	121	106	147	
13		507	210	81	113	99	129	
14		465	166	79	99	99	121	
15		425	156	79	113	113	–	
16		353	156	79	210	–	–	
17		320	234	73	63	121	–	
18		261	187	79	187	106	–	
19	187	234	166	75	210	106	147	
20	187	234	138	85	166	–	138	
21	177	261	138	79	147	99	–	
22	312	234	129	79	138	121	106	
23	320	–	289	79	261	147	99	
24	320	353	210	79	210	121	99	
25	336	465	166	85	353	113	98	
26	371	425	147	95	247	113	99	
27	371	320	156	85	261	166	92	
28	–	187	138	73	210	320	47	
29	425	166	121	73	166	353	99	
30	425	129	113	–	129	371	129	
31		129		92	210		129	

Source: Provisional data collected by the National Weather Service Alaska Pacific Weather Forecast Center.

Note: "-" = value can't be calculated due to limitations of the data.

Appendix C3.-Deep Creek predicted daily high and low tide heights, May 1 through June 30, 2006.

	Tide height (ft)											
	May						June					
	High			Low			High			Low		
Date	A.M.	P.M.	Av.	A.M.	P.M.	Av.	A.M.	P.M.	Av.	A.M.	P.M.	Av.
1	20.2	17.5	18.9	3.1	-2.0	0.6	16.7	15.8	16.3	5.5	0.9	3.2
2	18.5	16.0	17.3	4.5	-0.2	2.2	15.3	15.3	15.3	6.1	2.2	4.2
3	16.6	14.8	15.7	5.9	1.6	3.8	14.1	15.2	14.7	6.5	3.4	5.0
4	14.9	14.2	14.6	7.1	3.1	5.1	13.4	15.4	14.4	6.3	4.4	5.4
5	13.7	14.3	14.0	7.6	3.9	5.8	13.2	15.9	14.6	5.5	5.0	5.3
6	13.3		13.3	7.1	4.1	5.6		13.7	13.7	4.3	5.3	4.8
7	15.0	13.9	14.5	5.9	4.0	5.0	16.6	14.5	15.6	2.8	5.3	4.1
8	15.9	14.8	15.4	4.3	3.7	4.0	17.4	15.5	16.5	1.4	5.2	3.3
9	17.0	15.9	16.5	2.7	3.5	3.1	18.3	16.5	17.4	0.0	4.8	2.4
10	18.0	16.9	17.5	1.1	3.2	2.2	19.1	17.3	18.2	-1.3	4.5	1.6
11	19.0	17.7	18.4	-0.2	3.1	1.5	19.8	17.9	18.9	-2.3	1.1	-0.6
12	19.8	18.3	19.1	-1.3	3.1	0.9	20.4	18.2	19.3	-3.0	3.8	0.4
13	20.3	18.5	19.4	-2.1	3.3	0.6	20.6	18.3	19.5	-3.4	3.7	0.2
14	20.3	18.3	19.3	-2.4	3.6	0.6	20.4	18.2	19.3		-3.2	-3.2
15	20.3	17.8	19.1	-2.4	4.2	0.9	19.8	18.1	19.0	3.6	-2.7	0.5
16	19.9	17.1	18.5		-2.0	-2.0	18.8	18.0	18.4	3.7	-1.7	1.0
17	19.1	16.4	17.8	4.7	-1.3	1.7	16.6	18.0	17.3	3.6	-0.4	1.6
18	18.0	15.9	17.0	5.3	-0.4	2.5	16.3	18.1	17.2	3.3	1.1	2.2
19	16.8	15.9	16.4	5.7	0.5	3.1	15.4	18.4	16.9	2.7	2.5	2.6
20	15.8	16.5	16.2	5.5	1.3	3.4	15.2	18.7	17.0	1.6	3.5	2.6
21	15.5	17.5	16.5	4.5	1.8	3.2		15.6	15.6	0.3	4.1	2.2
22	15.9		15.9	2.7	1.9	2.3	19.2	16.3	17.8	-1.0	4.3	1.7
23	18.7	16.8	17.8	0.6	2.0	1.3	19.6	17.2	18.4	-2.0	4.2	1.1
24	19.9	17.8	18.9	-1.4	2.0	0.3	19.9	17.8	18.9	-2.7	4.0	0.7
25	20.8	18.6	19.7	-2.9	2.1	-0.4	20.1	18.3	19.2	-3.0	3.8	0.4
26	21.4	19.2	20.3	-3.9	2.3	-0.8	20.1	18.4	19.3	-2.9	3.7	0.4
27	21.5	19.2	20.4	-4.2	2.6	-0.8	19.8	18.3	19.1	-2.5	3.8	0.7
28	21.2	18.9	20.1	-3.9	3.2	-0.4	19.3	18.0	18.7		-1.8	-1.8
29	20.5	18.3	19.4	-3.0	3.8	0.4	18.5	17.6	18.1	4.1	-0.9	1.6
30	19.4	17.4	18.4		-1.9	-1.9	17.4	17.2	17.3	4.4	0.3	2.4
31	18.1	16.5	17.3	4.6	-0.5	2.1						

Source: NOAA Tides & currents website [Internet], 2006. Available from: http://tidesandcurrents.noaa.gov.

Appendix C4.-Deep Creek predicted daily high and low tide heights, July 1 through August 31, 2006.

	Tide height (ft)											
	July						August					
	High			Low			High			Low		
Date	A.M.	P.M.	Av.	A.M.	P.M.	Av.	A.M.	P.M.	Av.	A.M.	P.M.	Av.
1	16.3	16.7	16.5	4.8	1.7	3.3	14.7	17.0	15.9	4.2	5.1	4.7
2	15.0	16.4	15.7	5.1	3.1	4.1	13.5	16.4	15.0	4.6	6.6	5.6
3	13.9	16.1	15.0	5.3	4.5	4.9	12.7	16.0	14.4	4.8	7.9	6.4
4	13.1	16.1	14.6	5.1	5.8	5.5	13.0	16.2	14.6	4.3	8.4	6.4
5	12.9	16.3	14.6	4.5	6.7	5.6		14.2	14.2	3.0	7.9	5.5
6		13.5	13.5	3.5	7.0	5.3	17.1	15.7	16.4	1.3	6.5	3.9
7	16.8	14.5	15.7	2.1	6.8	4.5	18.5	17.4	18.0	-0.6	4.8	2.1
8	17.6	15.7	16.7	0.6	6.1	3.4	20.2	19.0	19.6	-2.4	3.0	0.3
9	18.6	16.9	17.8	-1.0	5.1	2.1	21.6	20.5	21.1	-3.6	1.4	-1.1
10	19.8	18.0	18.9	-2.4	4.1	0.9	22.6	21.6	22.1	-4.2	0.0	-2.1
11	20.8	19.0	19.9	-3.5	3.1	-0.2	22.9	22.2	22.6	-4.0	-0.8	-2.4
12	21.5	19.7	20.6	-4.1	2.2	-1.0	22.3	22.3	22.3		-2.9	-2.9
13	21.6	20.1	20.9	-4.1		-4.1	21.1	21.9	21.5	-1.0	-1.2	-1.1
14	21.1	20.3	20.7	1.6	-3.4	-0.9	19.3	20.9	20.1	-0.6	1.0	0.2
15	20.1	20.2	20.2	1.3	-2.0	-0.4	17.2	19.5	18.4	0.3	3.4	1.9
16	18.6	19.8	19.2	1.3	-0.2	0.6	15.3	18.0	16.7	1.4	5.7	3.6
17	16.9	19.2	18.1	1.5	1.9	1.7	14.3	16.9	15.6	2.4	7.3	4.9
18	15.4	18.6	17.0	1.6	3.9	2.8		14.6	14.6	2.5	7.7	5.1
19	14.6	18.1	16.4	1.6	5.5	3.6	16.6	15.6	16.1	1.8	7.0	4.4
20		14.7	14.7	1.1	6.2	3.7	17.1	16.8	17.0	0.9	5.8	3.4
21	17.9	15.6	16.8	0.3	6.2	3.3	18.1	17.9	18.0	0.0	4.6	2.3
22	18.2	16.6	17.4	-0.5	5.6	2.6	19.0	18.8	18.9	-0.6	3.4	1.4
23	18.7	17.5	18.1	-1.2	4.8	1.8	19.8	19.5	19.7	-0.9	2.5	0.8
24	19.3	18.2	18.8	-1.7	4.0	1.2	20.3	20.1	20.2	-0.9	1.9	0.5
25	19.7	18.7	19.2	-2.0	3.4	0.7	20.4	20.3	20.4	-0.6	1.5	0.5
26	19.9	19.0	19.5	-1.9	3.1	0.6	20.1	20.3	20.2	0.2	1.5	0.9
27	19.8	19.1	19.5	-1.5	2.9	0.7	19.4	20.0	19.7		1.3	1.3
28	19.3	19.0	19.2		-0.7	-0.7	18.3	19.4	18.9	1.8	2.7	2.3
29	18.5	18.7	18.6	3.0	0.4	1.7	16.9	18.6	17.8	2.3	4.3	3.3
30	17.4	18.2	17.8	3.3	1.8	2.6	15.4	17.6	16.5	3.1	5.9	4.5
31	16.1	17.6	16.9	3.7	3.4	3.6	13.9	16.6	15.3	3.9	7.4	5.7

Source: NOAA Tides & currents website [Internet], 2006. Available from: http://tidesandcurrents.noaa.gov.

APPENDIX D. NINILCHIK RIVER CHINOOK SALMON CODED WIRE TAG DATA

Appendix D1.-Coded wired tag data for adipose-clipped Chinook salmon recovered at Ninilchik River weir, 2006.

Sample identification no.		Brood	Rearing	Smolt release		Recovery	Ocean age					Length
								Scale reader estimates[a]				
CWT	Head[b]	year	hatchery[c]	Site[d]	Date	date	Actual[e]	First	Second	Resolved	Sex	(mm)
310282	277186	2001	Ft. Rich	Ninilchik	6/14/02	7/8/06	4	4	4	4	F	745
310282	277194	2001	Ft. Rich	Ninilchik	6/14/02	7/18/06	4	4	4	4	F	865
310282	189511	2001	Ft. Rich	Ninilchik	6/14/02	7/20/06	4	UR	UR	UR	F	825
310282	189508	2001	Ft. Rich	Ninilchik	6/14/02	7/20/06	4	UR	UR	UR	F	760
310282	189512	2001	Ft. Rich	Ninilchik	6/14/02	7/20/06	4	4	4	4	F	790
310282	144317	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	905
310282	144307	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	745
310282	144309	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	800
310282	144310	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	850
310282	144308	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	810
310282	144302	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	760
310282	144304	2001	Ft. Rich	Ninilchik	6/14/02	7/26/06	4	4	4	4	F	870
310282	189531	2001	Ft. Rich	Ninilchik	6/14/02	8/1/06	4	3	4	4	F	ND
310282	189532	2001	Ft. Rich	Ninilchik	6/14/02	8/1/06	4	3	3	3	F	ND
310273	189516	2002	Ft. Rich	Crooked	6/5/03	7/26/06	3	3	3	3	M	690
310193	277198	2002	Ft. Rich	Ninilchik	6/12/03	7/22/06	3	3	3	3	F	690
310193	144316	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	3	3	3	F	720
310256	277188	2002	Ft. Rich	Ninilchik	6/12/03	7/11/06	3	3	3	3	M	685
310256	189517	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	3	3	3	F	660
310256	189518	2002	Ft. Rich	Ninilchik	6/12/03	7/27/06	3	3	4	3	F	710
310256	189527	2002	Ft. Rich	Ninilchik	6/12/03	7/30/06	3	2	3	3	F	720
310256	189510	2002	Ft. Rich	Ninilchik	6/12/03	7/20/06	3	UR	UR	UR	F	710

-continued-

Sample identification no.		Brood	Rearing	Smolt release		Recovery	Ocean age					Length
								Scale reader estimates[a]				
CWT	Head[b]	year	hatchery[c]	Site[d]	Date	date	Actual[e]	First	Second	Resolved	Sex	(mm)
310256	144301	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	3	3	3	F	730
310256	144303	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	NR	3	3	F	735
310256	144312	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	3	3	3	F	720
310256	144314	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	3	3	3	F	760
310256	144315	2002	Ft. Rich	Ninilchik	6/12/03	7/26/06	3	3	3	3	F	725
310256	189530	2002	Ft. Rich	Ninilchik	6/12/03	8/1/06	3	NR	NR	NR	F	ND
310256	189529	2002	Ft. Rich	Ninilchik	6/12/03	8/1/06	3	4	3	3	F	ND
310256	189529	2002	Ft. Rich	Ninilchik	6/12/03	8/1/06	3	3	2	3	F	695
310318	277185	2002	Ft. Rich	Ninilchik	5/14/04	7/5/06	2	2	2	2	F	660
310318	277187	2002	Ft. Rich	Ninilchik	5/14/04	7/10/06	2	2	2	2	M	690
310318	277192	2002	Ft. Rich	Ninilchik	5/14/04	7/15/06	2	2	2	2	M	660
310318	277193	2002	Ft. Rich	Ninilchik	5/14/04	7/17/06	2	2	3	2	M	705
310318	277195	2002	Ft. Rich	Ninilchik	5/14/04	7/19/06	2	2	2	2	M	610
310318	277197	2002	Ft. Rich	Ninilchik	5/14/04	7/21/06	2	1	2	2	M	605
310318	277199	2002	Ft. Rich	Ninilchik	5/14/04	7/23/06	2	2	2	2	M	550
310318	189515	2002	Ft. Rich	Ninilchik	5/14/04	7/25/06	2	2	2	2	M	620
310318	189521	2002	Ft. Rich	Ninilchik	5/14/04	7/28/06	2	2	2	2	M	660
310318	144311	2002	Ft. Rich	Ninilchik	5/14/04	7/26/06	2	2	2	2	F	715
310318	144306	2002	Ft. Rich	Ninilchik	5/14/04	7/26/06	2	2	2	2	F	680
310318	189528	2002	Ft. Rich	Ninilchik	5/14/04	8/1/06	2	2	2	2	F	ND
310318	189528	2002	Ft. Rich	Ninilchik	5/14/04	8/1/06	2	2	3	2	M	640
310341	277190	2003	Ft. Rich	Ninilchik	5/19/05	7/14/06	1	1	1	1	M	410

-continued-

Sample identification no.		Brood	Rearing	Smolt release		Recovery	Ocean age					Length
								Scale reader estimates[a]				
CWT	Head[b]	year	hatchery[c]	Site[d]	Date	date	Actual[e]	First	Second	Resolved	Sex	(mm)
310341	277191	2003	Ft. Rich	Ninilchik	5/19/05	7/14/06	1	1	1	1	M	445
310341	277200	2003	Ft. Rich	Ninilchik	5/19/05	7/24/06	1	1	1	1	M	390
310341	189513	2003	Ft. Rich	Ninilchik	5/19/05	7/24/06	1	1	1	1	M	415
310341	189514	2003	Ft. Rich	Ninilchik	5/19/05	7/25/06	1	1	1	1	M	410
310341	189519	2003	Ft. Rich	Ninilchik	5/19/05	7/27/06	1	1	1	1	M	410
310341	189520	2003	Ft. Rich	Ninilchik	5/19/05	7/27/06	1	1	1	1	M	340
310341	189522	2003	Ft. Rich	Ninilchik	5/19/05	7/28/06	1	1	1	1	M	455
310341	189523	2003	Ft. Rich	Ninilchik	5/19/05	7/28/06	1	1	1	1	M	400
310341	189524	2003	Ft. Rich	Ninilchik	5/19/05	7/28/06	1	1	1	1	M	420
310341	189525	2003	Ft. Rich	Ninilchik	5/19/05	7/29/06	1	1	1	1	M	420
310341	189526	2003	Ft. Rich	Ninilchik	5/19/05	7/29/06	1	1	1	1	M	430
310341	189535	2003	Ft. Rich	Ninilchik	5/19/05	8/1/06	1	1	1	1	M	420
ND	277196	-	ND	ND	ND	7/20/06	ND	2	2	2	M	600
ND	277189	-	ND	ND	ND	7/13/06	ND	2	2	2	M	640
ND	144305	-	ND	ND	ND	7/26/06	ND	3	3	3	F	700
ND	144313	-	ND	ND	ND	7/26/06	ND	3	3	3	F	780
ND	189509	-	ND	ND	ND	7/19/06	ND	4	4	4	F	790

Note: ND = no data (no coded wire tag [CWT] detected for this Chinook salmon with a missing adipose fin); "-" = can't be computed due to limitations of the data.

[a] NR = Not readable scale sample due to regeneration or poor mounting.

[b] Cinch strap number for head sample.

[c] Hatchery (e.g., Ft. Rich = Fort Richardson; Elm. = Elmendorf) where coded wire tagged Chinook salmon smolt were reared.

[d] Site where coded wired tagged Chinook salmon were released (Ninilchik = Ninilchik River; Crooked = Crooked Creek).

[e] Actual age determined from CWT data.

Appendix D2.-Coded wire tag data for hatchery-reared Ninilchik River Chinook salmon recovered from escapement projects and hatcheries by stocking level, brood years 1987–2003.

		Coded wire tag recoveries (number of Chinook salmon)																				
		Brood years with high number of stocked smolt [a]								Brood years with low numbers of stocked smolt [b]												
Recovery locations		1987	1988	1989	1990	1991	1992	1993	Subtotal	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Subtotal	Total
Lower Cook Inlet	Anchor River								0					1		9				10	10
	Deep Creek					1	14	8	23	9	13	67	23	8	10	10	3	3		146	169
	Ninilchik				6	80	93	101	280	66	56	164	82	139	100	83	75	39	13	817	1,097
	Subtotal	0	0	0	6	81	107	109	303	75	69	231	105	148	110	102	78	42	13	973	1,276
Upper Cook Inlet	Crooked Creek	16	1	11					28			1								1	29
	Soldotna							1	1											0	1
	Subtotal	16	1	11	0	0	0	1	29	0	0	1	0	0	0	0	0	0	0	1	30
Prince William Sound	Wally Noerenberg			1					1											0	1
Unknown port	Subtotal										1			1						2	2
Total		16	1	12	6	81	107	110	333	75	70	232	105	149	110	102	78	42	13	976	1,309

Note: Smolt were released at various locations in the river from 1988 to 1994; smolt were held in Ninilchik Harbor intertidal-saltwater area prior to release in 1995 and 1996; smolt were released approximately 4.5 RKM upstream of Ninilchik River mouth from 1997 to 2004.

[a] Approximately 200,000 Chinook salmon smolt stocked of which approximately 20% were adipose finclipped and fitted with coded wire tags.

[b] Approximately 50,000 Chinook salmon smolt stocked, of which 100% were adipose finclipped, fitted with coded wire tags, and thermal marked.

Appendix D3.-Coded wire tag data for hatchery-reared Ninilchik River Chinook salmon recovered from freshwater sport harvests by stocking level, brood years 1987–2003.

		Coded wire tag recoveries (number of Chinook salmon)																					
		Brood years with high number of stocked smolt [a]								Brood years with low numbers of stocked smolt [b]													
Recovery locations		1987	1988	1989	1990	1991	1992	1993	Subtotal	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Subtotal	Total
Lower Cook Inlet	Anchor Point								0											0	0
	Deep Creek								0	2										2	2
	Ninilchik			29	5	105	79	13	231	1		2								3	234
	Homer	81	28	46	1				156				4	1			1			6	162
	Subtotal	81	28	75	6	105	79	13	387	3	0	2	4	1	0	0	1	0	0	11	398
Upper Cook Inlet	Anchorage	1							1	1										1	2
	Palmer								0				1							1	1
	Crooked Creek	1							1											0	1
	Soldotna					3			3	3	1									4	7
	Subtotal	2	0	0	0	3	0	0	5	4	1	0	1	0	0	0	0	0	0	6	11
Total		83	28	75	6	108	79	13	392	7	1	2	5	1	0	0	1	0	0	17	409

Note: Smolt were released at various locations in the river from 1988 to 1994; smolt were held in Ninilchik Harbor intertidal-saltwater area prior to release in 1995 and 1996; smolt were released approximately 4.5 RKM upstream of Ninilchik River mouth from 1997 to 2004.

[a] Approximately 200,000 Chinook salmon smolt stocked of which approximately 20% were adipose-clipped and fitted with coded wire tags.

[b] Approximately 50,000 Chinook salmon smolt stocked, of which 100% were adipose-clipped, fitted with coded wire tags, and thermal marked.

Appendix D4.-Coded wire tag data for hatchery-reared Chinook salmon recovered from saltwater sport and commercial harvests by stocking level, brood years 1987–2003.

		Coded wire tag recoveries (number of Chinook salmon)																				
		Brood years with high number of stocked smolt [a]								Brood years with low numbers of stocked smolt [b]												
Recovery locations		1987	1988	1989	1990	1991	1992	1993	Subtotal	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Subtotal	Total
Lower Cook Inlet	Anchor Point							1	1	4	8	9	4		1					26	27
	Deep Creek					3	12	13	27	11	20	15	1							47	74
	Ninilchik						1	1	2	24	26	4	1	7		1	1	1		65	67
	Homer	2		1	1	1	1	1	7	1	4		2	1						8	15
	Subtotal	2	0	1	1	4	14	16	37	40	58	28	8	8	1	1	1	1	0	146	183
Upper Cook Inlet	Kasilof						1		1	16	14	1	1	3			1			36	37
	Kenai								0	1	7									8	8
	Soldotna						2		2	1	1	2								4	6
	Subtotal	0	0	0	0	0	3	0	3	18	22	3	1	3	0	0	1	0		48	51
Kodiak	Kodiak								0	2	7	5								14	14
Prince William Sound	Valdez		1						1											0	1
	Cordova								0						1					1	1
	Subtotal	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	2
Southeast	Yakutat							1	1											0	1
	Pelican								0		1									1	1
	Hoonah								0		1		1							2	2
	Ketchikan							1	1											0	1
	Sitka								0	1		2		1		1				5	5
	Subtotal	0	0	0	0	0	0	2	2	1	2	2	1	1	0	1	0	0	0	8	10
Total		2	1	1	1	4	17	18	43	61	89	38	10	12	2	2	2	1	0	217	260

Note: Smolt were released at various locations in the river from 1988 to 1994; smolt were held in Ninilchik Harbor intertidal-saltwater area prior to release in 1995 and 1996; smolt were released approximately 4.5 RKM upstream of Ninilchik River mouth from 1997 to 2004.

[a] Approximately 200,000 Chinook salmon smolt stocked of which approximately 20% were adipose-clipped and fitted with coded wire tags.

[b] Approximately 50,000 Chinook salmon smolt stocked, of which 100% were adipose-clipped, fitted with coded wire tags, and thermal marked.

APPENDIX E. NINILCHIK RIVER CHINOOK SALMON SPORT HARVEST AND RELEASE ESTIMATES FROM ANGLER SURVEYS, 2006

Appendix E1.-Ninilchik River Chinook salmon harvest and release estimates from angler surveys conducted during the three 3-day weekend openings, 2006.

					Chinook salmon harvest (no. of fish)				Chinook salmon released (no. of fish)			
					Wild		Hatchery-reared		Wild		Hatchery-reared	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 1												
5/27	Sat	1	0000	2	0	1	0	0	0	0	0	0
			0100	2	0	1	0	0	0	0	0	0
		2	0400	2	0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
			0500	1	0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					1	0	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
			0600	1	0	1	0	0	0	0	0	0
					0	0	0	0	0	0	0	1
					0	1	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
				2	0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
			0700	1	0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	1	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
			0400	2	0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
			0500	1	0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0

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Appendix E1.–Page 2 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 1												
5/28	Sun	3	0500	1	0	1	0	0	0	1	0	0
					0	0	0	1	0	0	0	0
				2	0	0	0	0	0	1	0	0
			0600	2	0	0	0	0	0	1	0	0
			0700	1	0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
5/29	Mon	4	0400	1	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	1	0	0	0	0	0	0	0
					0	0	1	0	1	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
			0500	1	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	1	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	0	0	1	0	0	0	0
					0	0	0	2	0	0	0	0
			0600	1	0	0	0	0	0	1	0	0
					0	1	0	0	0	2	0	0
					0	1	0	1	0	0	0	0
				2	1	0	0	1	0	0	0	0
			0700	2	0	1	0	0	0	0	0	0
Weekend 2												
6/3	Sat	1	0000	1	0	0	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
			0100	2	0	1	0	0	0	1	0	0
					0	1	0	0	0	0	0	0

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Appendix E1.–Page 3 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 2												
6/3	Sat	1	0100	2	0	1	0	0	0	0	0	0
					0	0	0	0	0	0	0	1
					0	0	0	1	0	0	0	0
					0	1	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	1
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	1	0	0	0	0
			0200	1	0	0	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
			0300	1	0	0	1	0	0	0	0	0
		2	0400	1	0	0	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	1	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	0	0	1	0	0
				2	0	1	0	1	0	0	0	0
					0	0	0	0	0	1	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
			0500	1	0	1	0	1	0	0	0	0
					1	0	0	0	0	0	0	0

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Appendix E1.–Page 4 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 2												
6/3	Sat	2	0500	1	1	0	0	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	1	0	0	0	0
				2	0	1	0	0	0	1	0	0
					1	0	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	1	0	0	0	0
					0	2	0	0	0	0	0	0
			0600	1	0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	1	0	0	0	1	0
					1	0	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	4	0	0	0	0	0
					0	0	3	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	0	0	0	0	1	0	0
					0	0	0	0	0	0	0	1
			0700	1	0	0	0	1	0	0	0	0
					0	2	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	1	0	1	0	0	0	0
6/4	Sun	3	0400	1	0	0	0	1	0	0	0	0
					0	2	0	0	0	0	0	0
					0	2	0	0	0	0	0	0
			0500	1	0	0	1	0	0	0	0	0

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Appendix E1.–Page 5 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 2												
6/4	Sun	3	0500	1	0	1	0	0	0	0	0	0
			0600	2	0	1	0	0	0	1	0	0
					0	1	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
			0700	2	0	1	0	0	0	0	0	0
					0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
			0800	2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
6/5	Mon	4	0400	2	0	0	0	0	0	2	0	1
			0500	1	0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
			0600	2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
			0500	1	0	1	0	0	0	0	0	0
			0600	2	0	1	0	0	0	1	0	0
					0	1	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
			0700	1	0	1	0	0	0	0	0	0
					0	1	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
Weekend 3												
6/10	Sat	1	0000	1	0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
					0	1	0	1	0	0	0	0

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Appendix E1.–Page 6 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 3												
6/10	Sat	1	0000	2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
			0100	2	0	1	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
			0200	1	0	1	0	0	0	0	0	0
			0300	1	0	1	0	0	0	1	0	0
					0	0	1	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	0	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
		2	0400	1	0	0	0	1	0	0	0	0
					0	1	0	0	0	1	0	0
					0	0	1	1	0	0	0	0
					0	1	0	0	0	1	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	0	1	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	0	0	1	0	0
					0	0	1	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0

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Appendix E1.–Page 7 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 3												
6/10	Sat	2	0400	2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
			0500	1	0	0	2	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	1	2	0	0	0	0
					0	0	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	1	0	0	0	0
					0	1	1	1	0	0	0	0
					1	1	2	1	0	0	0	0
					0	0	1	0	0	0	0	0
					0	1	2	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	0	0	1	0	0	0	0
					0	0	0	0	0	1	0	0
					0	1	0	1	0	0	0	0
					0	0	0	0	0	1	0	0
			0600	1	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0

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Appendix E1.–Page 8 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 3												
6/10	Sat	2	0600	1	0	1	0	1	0	0	0	0
					0	0	1	1	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	0	0	0	0	1
					0	1	0	0	0	0	0	0
					0	1	0	0	0	4	0	0
					0	0	0	1	0	2	0	0
					0	0	0	1	0	0	0	0
			0700	1	0	1	0	0	0	0	0	0
					0	0	1	0	0	0	0	0
					0	0	0	0	0	3	0	5
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	2	0	0	1	0	0
					0	0	1	0	0	0	0	0
					0	0	0	0	0	1	0	0
					0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
6/11	Sun	3	0400	2	0	1	0	0	0	0	0	0
					1	0	1	0	0	0	0	0
					0	1	0	0	0	0	0	0
			0500	1	0	0	0	1	0	0	0	0
					0	0	0	2	0	0	0	0
					0	1	0	1	0	0	0	0
			0600	2	0	1	0	0	0	0	0	0
					0	1	0	0	0	1	0	0
			0700	1	0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0

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Appendix E1.–Page 9 of 9.

					Harvest				Released			
					Wild		Hatchery		Wild		Hatchery	
Date	Day	Survey	Hour	Reach	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL	Jacks	>500mm TL
Weekend 3												
6/11	Sun	3	0700	1	0	1	1	0	0	0	0	0
					0	1	0	0	0	0	0	1
					0	0	0	1	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
6/12	Mon	4	0500	2	0	1	0	1	0	0	0	0
					0	0	0	1	0	0	0	0
			0600	1	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					1	0	0	0	0	0	0	0
				2	0	0	0	0	0	1	0	0
					0	0	0	1	0	0	0	0
					0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
					0	0	0	0	0	1	0	0
			0700	1	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
				2	0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0
					0	1	0	0	0	0	0	0